



# **Pathways to 100% Clean Energy**

Strategies for fulfilling Resolution 124

October 16, 2019

**Prepared by the St. Louis Clean Energy Advisory Board  
Technical Committee**

## **Acknowledgements:**

On October 27, 2017, the St. Louis Board of Aldermen unanimously adopted Resolution 124, sponsored by Board President Lewis Reed, which established a goal for St. Louis to move to 100% clean energy in the electricity sector by 2035. At that time, St. Louis became the 47th City in the nation, and the largest in the Midwest, to adopt such a goal. Resolution 124 also established a process for developing a plan to meet that ambitious 100% clean energy goal. This Report is the result of that process.

The 100% clean energy goal of Resolution 124 is built on the foundation of multiple past City efforts led by the Mayor's office, the Board of Aldermen, and the City's Office of Sustainability. Significant among those past efforts to make St. Louis a healthier and more prosperous place to live, play and work are the City's Sustainability Plan, Greenhouse Gas Inventory, and Climate Action and Adaptation Plan. Those documents take an important and broad view of sustainability, with 29 priorities across a range of initiatives, including: urban ecology; arts, culture and innovation; diversity and equity; health and safety; infrastructure and transportation; education, training and leadership; and employment. In contrast, this Pathways Report is narrowly focused on changes related to the generation and use of electricity, as dictated by Resolution 124. The goals of Resolution 124 are consistent with, and a critical step towards, the goals of the City Sustainability Plan.

This Pathways Report was developed over a period of 18 months through a transparent and inclusive stakeholder process, led by Aldermanic Board President Lewis Reed and Legislative Director Mary Ries. The following individuals provided their input and expertise to the development of this Report as members of the Resolution 124 Technical Advisory Committee (listed alphabetically):

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These individuals contributed to this Report in their personal capacity as members of the Technical Committee. Any technical analysis, discussions, considerations and observations included herein represent the collective views of the Technical Committee as it relates to Resolution 124 and do not constitute an endorsement or representation from an individual's perspective or from their respective organizations or employers. All analyses were completed

using publicly or commonly available data and models. Analyses are provided as a scoping exercise to indicate relative levels of priorities and potential. An individual assessment of specific projects is outside the scope of this volunteer-led Report. The City should continue to leverage third party technical assistance to identify and implement cost-effective clean energy solutions.

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## Executive Summary






***Resolution 124 sets an ambitious goal for the City of St. Louis to transition to 100 percent clean energy in the electric sector through energy efficiency, wind and solar by 2035.***

Resolution 124 represents an opportunity to make new investments with positive benefits to the City's budget, regional health, economic competitiveness, and new jobs. This report considers the goal in two parts. Section II of the report focuses on electricity use for City operations. Here, the City can make direct investments and decisions on how it procures energy. Section III focuses on voluntary efforts within the broader community, which the City can influence but not control.

***The City cannot meet the goals of Resolution 124 alone:*** it will require coordinated and dedicated efforts from multiple parties. Most importantly, this includes Ameren Missouri, the regional electric utility. In 2015, St. Louis City residents and businesses used approximately 3 million megawatt-hours (MWh), or approximately 15 percent of all Ameren electricity sales. Ameren already procures renewable energy under the state's Renewable Energy Standard ("RES"). This will automatically put the City 15% of the way to its goal by 2021. Increasing the state RES likely offers one of the most cost-effective ways to meet future demand. The City and Ameren should continue to find mutually beneficial ways to expand clean energy offerings.

***There are multiple "pathways" or combinations and ownership models of energy efficiency, wind and solar resources that can be used to meet this goal.*** These pathways represent different combinations of costs and benefits to the City and the region.

**The Clean Energy Advisory Board adopted five goals** to help guide an assessment of tradeoffs between strategies:

<b>COST-EFFECTIVENESS</b>	
<b>JOBS</b>	
<b>HEALTH</b>	
<b>EQUITY</b>	
<b>EMISSIONS REDUCTIONS</b>	

The strategies detailed in this Report have been evaluated and scored according to these five goals. As part of developing this Report, the Advisory Board's Public Engagement Committee held more than 15 community engagement and stakeholder meetings across the City and

received survey responses from more than 1,000 residents and taxpayers in the City. Stakeholder input reaffirmed these five goals, and emphasized the importance of considering health, equity, and jobs benefits that can result from investments in clean energy.

### **City Operations**

***Based upon the established criteria, the Technical Committee recommends the adoption of a combined energy efficiency, behind-the-meter solar and off-site renewable energy procurement strategy to meet the goals of Resolution 124 for City operations.*** Further, given the range of options available, *the City should set a more aggressive interim target to meet the 100 percent goal in City Operations by 2025.* This will not only lock in expiring federal incentives but put St. Louis on pace with other comparable cities and establish a foundational architecture for the broader community-wide goal.

***Energy Efficiency represents a “no regrets” strategy that offers immediate financial savings and a chance for the City to reduce annual expenses through targeted capital expenditures.*** The City should pursue all cost-effective energy efficiency opportunities. Although there are a variety of avenues to increasing the efficiency of City-owned facilities, this Report estimates that a robust approach could save the City up to \$500,000 per year. These savings may in turn be one of many options to establishing an energy savings fund that creates a dedicated revenue stream from savings to be used for future clean energy programs also noted in the Report.

***New solar installations can offer an opportunity for the City to reduce costs with positive payback.*** Solar could meet at least 10 percent of the Resolution 124 goal, although the net cost of solar will depend significantly on the ownership model, presence of federal incentives, and size of the system. It is the Committee’s view that the City can achieve positive investment returns, particularly for leased systems strategically located on large buildings with high energy load. By partnering with other regional stakeholders and institutions, and leveraging third party technical assistance, the City can help aggregate and leverage purchasing power to achieve economies of scale and the best results.

***The City can close the gap between local initiatives and the 100% goal through entering into energy procurement contracts with large, ideally regional, renewable energy generators.*** Although there is a balance to consider between lowest cost and highest local impact, the City should focus on the “virtual” procurement of new wind or solar energy from projects within or outside the Midwest region. A “virtual” strategy would also add additional financial risks, uncertainty and reporting requirements that would need to be considered.

## **Community-Wide Operations**

The City is in a position of influence but not full control as it pertains to larger Community-Wide efforts to achieve 100% clean energy. ***Therefore, the Technical Committee recommends a robust strategy of advocacy, incentives, and education to create maximum impact toward achieving the Community-Wide goal of 100% clean energy by 2035.*** The City does not oversee Ameren Missouri or regulate its service offerings. However, the City can encourage clean energy adoption by enacting policies and standards, conducting educational efforts, and providing input at other levels of government. Section III of this Report outlines steps that can be implemented today by the Board of Aldermen and Mayor's office, along with other educational and advocacy opportunities available to the City. These steps will build on the growing success with the City Energy Project and the benchmarking ordinance, new building energy codes, the Bloomberg American Cities Climate Challenge, and other existing efforts from the Planning & Urban Design Agency's Sustainability Program. St. Louis corporations continue to demonstrate a demand for renewable resources and efficiencies, and additional leadership from the City will likely be critical to attracting and retaining new businesses and employees.

***Through its actions, the City will join more than 300 other cities and corporate leaders – many in the St. Louis region – in building the economy of tomorrow, today.***<sup>1</sup> Through targeted investments and close partnerships, the City can unlock new financial benefits for the City's budget and City residents, while also creating a healthier, more equitable, and more competitive economy.

## **SUMMARY OF STRATEGIES**

To meet the goals of Resolution 124, the Technical Committee developed these strategies for achieving 100% clean energy in City Operations and Community-Wide Operations, based on community engagement efforts and the scoping analysis of technical, economic and regulatory factors described herein.

### **City Operations**

Within City Operations, St. Louis will need to achieve 100% clean energy through a combination of saving energy, building its own renewable energy generation, and purchasing renewable energy. St. Louis should prioritize the regional procurement of additional clean energy. Community engagement demonstrated a clear preference for health, jobs and equity in addition to cost-effectiveness. These goals are best met through regional and local procurement, including through Ameren-sponsored programs.

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<sup>1</sup> See: Ready for 100 (cities and states) <https://www.sierraclub.org/ready-for-100> and RE 100 (corporations) <http://there100.org/>

Below is the list of strategies to achieve 100% clean energy in City operations. To meet the goal, the City should first aggressively pursue all cost-effective energy efficiency, then collaborate for targeted solar opportunities, and seek large scale procurement of regional wind supplies.

***Energy Efficiency (at least 10 percent of goal)***

*“All cost-effective energy efficiency” is a term in the industry that means making investments in energy-saving technology that will result in financial savings and net economic benefits over a certain time period. Energy efficiency is typically considered the least costly resource for both utilities and customers, and it should be no different for St. Louis. The City should pursue all cost-effective energy efficiency in City-owned buildings by making investments that will pay back within five years (to meet the 2025 goal).*

1. Aggressively pursue all Cost-Effective Energy Efficiency in City-Owned Buildings
  - a. Energy Management through Benchmarking and Behavioral Change
  - b. Seek ENERGY STAR certification for 100% of all eligible City Buildings by 2030
  - c. Hire/appoint an Energy Manager in the Facilities Division, to support EE efforts
  - d. Provide regular Operations & Maintenance and sustainability training for Facilities and other City staff (GPRO, BOC, LEED or other)

***Solar (at least 10 percent of goal)***

The City should also install its own clean energy generation. Solar is most obvious, given its high visibility, and its ability to be installed near large electric loads. It is a mature technology.

2. Install Rooftop Solar on a Portfolio of City-Owned Buildings

***Wind (up to 80 percent of goal)***

Finally, the City should procure wind energy. Wind has emerged as an extremely cheap option for new electricity generation, not only for clean energy but for energy in general. In the long run, wind should offer the quickest and simplest path to achieving 100% clean energy, while also offering the City a chance to save money. The options are:

3. Regional Wind Procurement through Ameren’s “Renewable Choice” Program
  - 4a. Regional Virtual Power Purchase Agreement
  - 4b. Remote Virtual Power Purchase Agreement

**The Community-Wide Goal**

To meet the community-wide goal of 100% clean energy by 2035, the City should continue to collaborate and engage with Ameren, the local utility provider, and represent the City’s interests in additional renewable energy before the State legislature and Missouri Public Service

Commission. In order to encourage residential and private sector investment across the St. Louis City community, the City should consider enacting several policies, either as ordinances passed by the Board of Alderman or as actions taken by the relevant City Departments. In addition, the City should consider opportunities to affect state and federal policy by engaging in these forums where possible. Finally, the City can play a key role through offering education and training for City residents and staff.

Note: given the longer-term goal and the voluntary nature of the community-wide sector, we have not assigned percentage values to each resource. Rather the community-wide section of the Report should be seen as aspirational, wide-reaching, and open-ended for including future technologies and strategies.

### **Energy Efficiency**

1. Expand and Improve upon Benchmarking Efforts
2. Adopt a Building Energy Performance Standard Policy
3. Reflective or White Roofing Requirement
4. Requirement for Owners/Operators of Affordable Housing to Obtain Building Energy Assessment
5. Require Energy Disclosure at Point of Sale for Commercial and Residential Buildings

### **Solar**

6. Solar Ready Requirements for New Construction and Major Renovations
7. Streamline Permitting and Inspections for Renewable Energy Development
8. Participate in a “Solarize” or Bulk Purchasing Program for Solar Equipment

### **Education/Training Opportunities**

9. Conduct Training and Educational Activities for City Residents and Building Owners
10. Promote/Incentivize Clean Energy Workforce Development for City Residents

### **Other Activities**






11. Implement Policies that Require Development Projects Receiving Tax Benefits to Meet Certain Energy Savings Requirements
12. Electric Vehicle-Ready Requirements for New Construction and Major Renovation
13. Provide Input in State and Federal Energy Policy Venues
14. Formalize a Sustainability Commission or Advisory Board

### **Strategy Evaluation Using the Five Goals of the Clean Energy Advisory Board**

At the beginning of each section, strategies are compared side-by-side according to five goals, or metrics of success, developed by the Advisory Committee and the Community Engagement Committee. These goals are: 1) cost-effectiveness; 2) job creation potential; 3) health impacts; 4) equity concerns; and 5) emissions reduction. These tables should be carefully considered by

decision makers when selecting which strategies receive priority.

The below table represents a “key” where each strategy has been assigned a Policy Score on a scale of 0 through 4 for each of the five goals. Survey data collected by the City over several months revealed that St. Louis City residents place high value on each of the five goals, the conclusion being that the City should strive to ensure that the selected strategies address each of the five goals. For example, if a particular strategy scores very highly on cost-effectiveness, but poorly on jobs, health, and equity, then the Advisory Committee and other decision-makers should consider carefully whether that strategy should be pursued.

					
<b>Policy Score</b>	<b>Cost Effectiveness</b>	<b>Jobs Potential</b>	<b>Health Impacts</b>	<b>Equity Concerns</b>	<b>Emissions Reductions</b>
0	<i>Not cost effective/ recommended</i>	<i>No impact on job development</i>	<i>No effect on health in the region</i>	<i>No benefits / unlikely to move existing conditions</i>	<i>No emissions reductions result</i>
1	<i>High cost for little savings</i>	<i>Little impact on job development</i>	<i>Minimal effect on health in the region</i>	<i>Little benefits / minimal effect on equity</i>	<i>Little to no reductions in fossil fuel emissions from power plants</i>
2	<i>Average cost for average savings</i>	<i>Some impact on job development</i>	<i>Some positive effect on health in the region</i>	<i>Fair benefits / some positive effect on equity</i>	<i>Some reductions in fossil fuel emissions from power plants</i>
3	<i>Lower than average cost and better returns</i>	<i>Positive impact on job development</i>	<i>Positive impact on health in the region</i>	<i>Good benefits / can improve existing conditions</i>	<i>Moderate reductions in fossil fuel emissions from power plants</i>
4	<i>Low cost for excellent returns / most cost-effective method</i>	<i>Very strong / positive impact on job development</i>	<i>Very positive impact on health / could deliver the best health benefits</i>	<i>Very good benefits / could greatly improve existing conditions</i>	<i>Significant reductions in fossil fuel emissions from power plants</i>

## I. INTRODUCTION

On October 27, 2017, the St. Louis Board of Aldermen unanimously adopted Resolution 124, sponsored by Board President Lewis Reed, establishing a goal for St. Louis to move to 100% clean energy in the electricity sector by 2035. At that time, St. Louis became the 47th city in the nation, and the largest in the Midwest, to adopt such a goal. As of July 2019, more than 130 cities have adopted a 100% clean energy goal.<sup>2</sup>

Resolution 124 is built on the foundation of multiple past City efforts and plans to make St. Louis a healthier and more prosperous place to live, play and work. Significant among those past efforts are the City's Sustainability Plan, Greenhouse Gas Inventory and Climate Action and Adaptation Plan. The City's Sustainability Plan was adopted in 2013 by the Planning Commission after months of work and public involvement by former Mayor Francis Slay's Office of Sustainability. The Plan includes objectives on energy efficiency, renewable energy, greenhouse gas reduction and climate action planning. The City's Climate Action and Adaptation Plan was finalized in 2017. It contains objectives that also support the goal of 100% clean energy, including strategies on energy efficiency and renewable energy.

In 2013, Mayor Slay issued a Sustainability Action Agenda establishing a goal of reducing community-wide greenhouse gas emissions in St. Louis by 25% by 2020 and 80% by 2050 from a 2005 baseline inventory. This goal is consistent with prior U.S. commitments made under the Paris Climate Agreement. It is also consistent with the stated goals of Ameren, the regional electric utility. In 2018, Mayor Lyda Krewson reaffirmed this goal and joined more than 280 other cities and counties as part of the "We Are Still In" pledge.<sup>3</sup> Also in 2018, Mayor Krewson signed the Sierra Club's Mayors for 100% Clean Energy Pledge to move the City and the U.S. to 100% clean energy, working with the community to realize that goal.<sup>4</sup> As of July 2019, more than 200 Mayors from across the U.S have signed the pledge.

In 2018, these efforts of Mayors Slay and Krewson were recognized nationally, as St. Louis was selected by Bloomberg Philanthropies as one of twenty-five leadership cities in its American Cities Climate Challenge initiative. St. Louis and the other leadership cities will receive a combined \$70 million in support over two years, with a particular focus on greenhouse gas emission reductions in the building and transportation sectors.

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<sup>2</sup> See: <https://www.sierraclub.org/ready-for-100>

<sup>3</sup> The "We Are Still In It" pledge; See: <https://www.wearestillin.com/signatories>

<sup>4</sup> See: <https://www.sierraclub.org/ready-for-100/mayors-for-clean-energy>

## Why Now?

With St. Louis' long history of climate action, Resolution 124 comes at an important moment. The price of renewable energy and energy efficiency continues to fall, with important Federal, State, and utility incentives in play for the next two years. These incentives create a window in time for the City of St. Louis to aggressively pursue all cost-effective measures – and leverage other capital sources to the benefit of the City. An October 2018 United Nations Intergovernmental Panel on Climate Change report found that global net emissions of carbon dioxide would need to fall by 45% from 2010 levels by 2030 in order to avoid the worst impacts of climate change.<sup>5</sup>

This Report focuses on actions that can be taken between 2020 and 2025 to capitalize on these current incentives. Future costs may be higher or lower, depending on the projection of costs, whether and at what level incentives are renewed, and the price of power in the future. Given this future uncertainty, and the options available today, this Report does not estimate net costs from future actions or installations in 2025 or beyond nor does it make any forecast as to the changing electrification landscape in future years.

In addition to the pressing climate need, over the last several years, many market forces and participants have created tailwinds of opportunity. Ameren has continued develop and implement more – and increasingly cheaper – clean energy. Missouri is subject to a Renewable Energy Standard (RES), under which investor-owned utilities (including Ameren) are required to source 10 percent of their retail sales from renewable sources for the years 2018 to 2020 and 15 percent in 2021 and beyond.<sup>6</sup> Notably, in its 2017 Integrated Resource Plan, Ameren established a goal to add 700 MW of wind to its generation mix by 2020, and 100 MW of solar by 2027. This trend is consistent with broader electricity markets in Missouri and across the nation.

Between 2009 and 2018, the cost of wind and solar both fell more than 70 percent, and in many regions, new wind resources are a more cost-effective source of energy than a new natural gas plant.<sup>7</sup> It's not surprising then that new installations of wind and solar capacity have boomed in recent years, outpacing all other investments in electricity capacity.

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<sup>5</sup> See: [https://report.ipcc.ch/sr15/pdf/sr15\\_spm\\_final.pdf](https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf)

<sup>6</sup> In MO, this includes electricity generated from solar, wind, small hydropower, and biogas as approved by MO DNR. In-state resources receive 1.25 RECs for every MWh of generation. Utilities are subject to financial penalties for non-compliance; however, utilities are also subject to a cost-cap, such that compliance with the RES cannot increase retail rates by greater than 1 percent per year relative to non-renewable resource generation.

In 2016, Ameren reported meeting a 5 percent standard at a cost of 0.322 percent, which was below the 1 percent cost cap.

For more information, see the Database of State Incentives for Renewables & Efficiency (available: <http://programs.dsireusa.org/system/program/detail/2622> and the Missouri Public Service Commission annual RES compliance reports (available: [https://psc.mo.gov/electric/Renewable\\_Energy\\_Standard\\_Compliance\\_Reports](https://psc.mo.gov/electric/Renewable_Energy_Standard_Compliance_Reports)

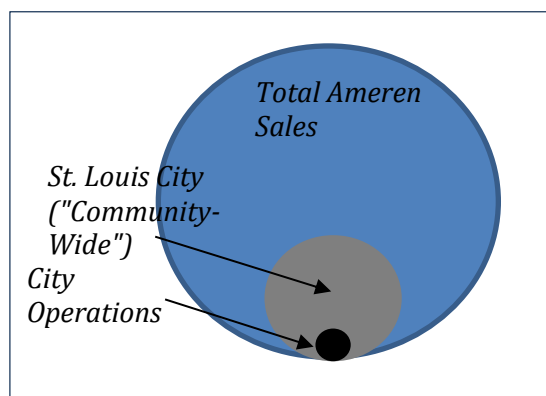
<sup>7</sup> Lazard's Levelized Cost of Energy Analysis 2018, v. 12.0: <https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf>

Lastly, with these challenges are also created opportunities for positive social, environmental and economic change (often called the “triple-bottom line” of sustainability). Investments in clean energy can have multiple community benefits: bill reductions and savings on energy expenditures; creating local jobs in energy efficiency and energy services; avoided health care costs from reducing air pollution-induced asthma attacks; reducing environmental impacts associated with greenhouse gas emissions, etc.

## Spheres of Influence

Meeting the goals established by Resolution 124 requires changes in both the generation and consumption of electricity. In 2015, the City of St. Louis reported total electricity use across all City accounts of 275,000 MWh.<sup>8</sup> All electricity consumed by accounts within the City boundaries was approximately 5,300,000 MWh.<sup>9</sup>

**Figure 1: City of St. Louis Demand relative to Ameren Sales (2018 approximate)**



Given the City’s varied ability to effect change within its own operations and for the region at large, this report develops recommendations to meet Resolution 124 in two parts: City operations and community-wide.

Section II of this report focuses on near term measures that can be used to implement the goals of Resolution 124 in City operations. This relates to the approximately 275,000 megawatt hours (“MWh”) of electricity consumed annually by the City of St. Louis, across the full footprint of its

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<sup>8</sup> Data estimate provided by Rene Dulle, author of the St. Louis 2015 Regional Greenhouse Gas Emission Inventory, consistent with the demand totals used in that analysis. Totals represent approximate average demand and include City-owned buildings (including the Courthouse and police headquarters), Lambert Airport, the municipal water plant, and all streetlights. Totals exclude the housing authority and public schools. Note that actual demand will vary annually based on several factors. This Report relies on this generic, approximate demand number because the purpose of the current analysis is to assess general tradeoffs, directional and relational costs between options, and estimate approximate total costs.

<sup>9</sup> Data provided by Ameren to the Technical Advisory Committee in October 2018. Similar to City use, data represents approximate annual averages.

municipal buildings and operations, including Lambert Airport.<sup>10</sup> The City maintains direct control over when and how to adopt clean energy strategies for its own benefit. Given the variety of options available and high degree of self-determination, the Technical Committee recommends that the City should strive to meet a more ambitious goal of 100 percent clean energy in City operations by 2025- which would allow the City to best capitalize on existing incentives and reduce overall costs. Meeting this intermediate goal will also allow the City to extend its leadership across the region as it moves toward the broader community-wide goal for 2035. This Report reviews and considers several programs, including:

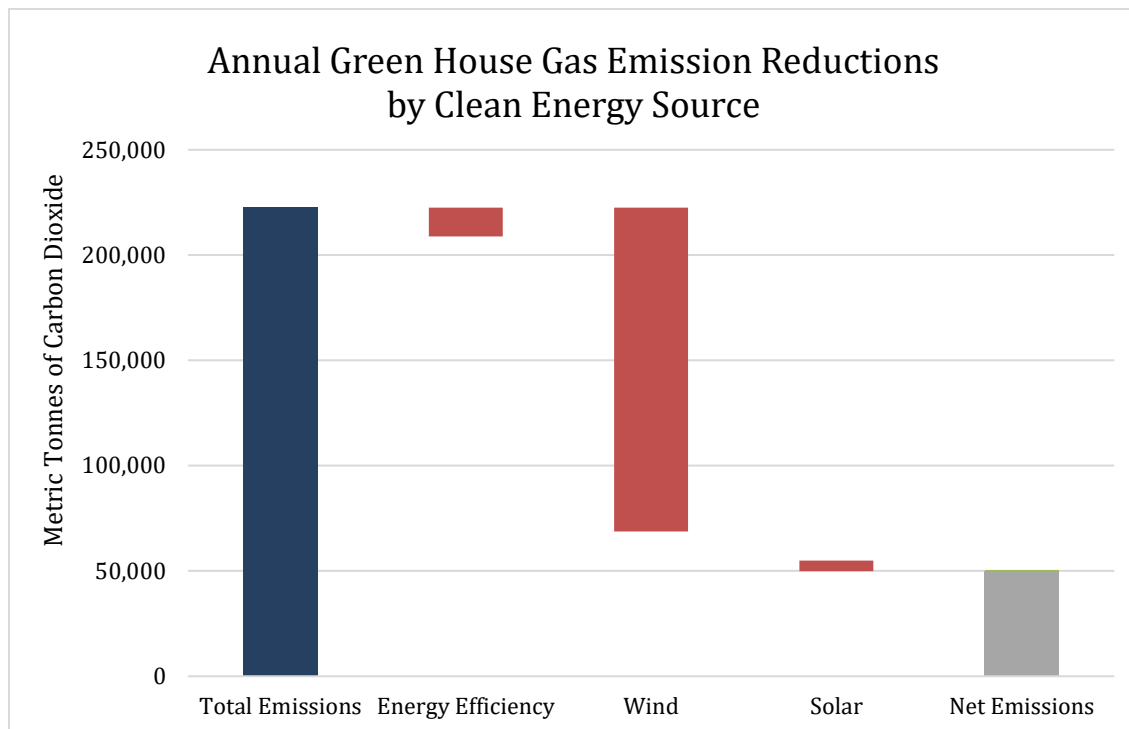
- **Energy Efficiency:** Participation in utility-funded EE programs, including the use of energy service contractors (“ESCOs”) to help with demand management.
- **Solar:** Including resources installed “behind the meter,” through either a lease or City ownership; and
- **Regional Procurement:** Including Ameren-owned generation, wind or solar purchased by the City through Ameren’s Renewable Choice “green tariff” program, and/or wind or solar sourced from the greater Midwest region through “virtual” power purchase agreements.

Section III of this report focuses on electricity consumed by businesses and residents in St. Louis City. These residents are served by Ameren Missouri. While Resolution 124 is consistent with Ameren’s own stated business goals to reduce greenhouse gas emissions, the City of St. Louis does not regulate or oversee Ameren’s operations, nor does Resolution 124 impose any authority over Ameren’s operations. Given the City’s lack of control to effectuate a certain outcome, Section III of this report focuses on tools and strategies that the City of St. Louis can use to incentivize Ameren and residents and businesses to adopt increasing quantities of clean energy, to the benefit of the region.

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<sup>10</sup> Data estimate provided by Rene Dulle, author of the St. Louis 2015 Regional Greenhouse Gas Emission Inventory, consistent with the demand totals used in that analysis.

**Figure 2: Resolution 124 Strategy Contributions to St. Louis GHG Inventory, “Regional Scenario”**















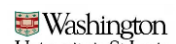
Notes and Sources: 2015 GHG Emission Inventory, available: <https://www.stlouis-mo.gov/government/departments/mayor/initiatives/sustainability/documents/2015-greenhouse-gas-emissions-inventory-report.cfm>. GHG emission reductions based on a “regional” pathway.

Despite St. Louis City’s limited reach in influencing behavior at the community-wide level, it is important to recognize the corporate partners that are united in this goal. Within the City of St. Louis, several corporations have made commitments to source 100 percent renewable energy in their operations or to otherwise reduce GHG emissions associated with their operations. St. Louis City should embrace and partner with these entities as doing so will create a climate to attract like-minded institutions and foster broader economic growth.

***The below table summarizes some of the most prominent businesses and institutions with a presence in the St. Louis region, along with their corresponding clean energy commitments.***

### **Voluntary Regional Commitments**

A large number of St. Louis' existing large employers are committed to a clean energy future. An environment that provides access to renewable energy and efficiency opportunities will be a key part of attracting new employers to locate in St. Louis City.

<b><u>Employer</u></b>	<b><u>Commitment</u></b>
	AB InBev has committed to transition its global operations to 100% renewable electricity, planning to secure 100% of the company's electricity from renewable sources by 2025.
	Allianz joins RE100 with a target to source 100% renewable electricity across its global operations by 2023.
	As a Better Buildings Challenge Partner, Ascension has committed to a 20% reduction in energy use by 2020 across 35 million square feet of acute care hospitals and related facilities.
	AT&T has invested heavily in wind energy, setting a 10x Carbon Reduction Goal to enable carbon savings 10 times the footprint of their operations by the end of 2025.
	As part of its commitment to grow its business responsibly, Bank of America has set a goal to become carbon neutral and purchase 100% renewable electricity by 2020.
	BJC Healthcare is committed to renewable energy, and recently reached a deal with Ameren to host a 1.8 MW solar system on one of its Central West End buildings.
	Enterprise Holdings continues a large investment in sustainability, including achieving LEED certifications in its buildings and investing in carbon offsets for its fleets.
	The company plans to meet the electricity needs of its 350 operations in 59 countries with renewable energy by 2050.
	IKEA has committed to produce as much renewable energy as the total energy it consumes in its buildings by 2020. IKEA Group is a founding partner of the RE100 campaign.
	Nestlé have set targets to reduce direct greenhouse gas emissions per tonne of product by 35% since 2005, by 2015. Increasing renewable energy will be used to support this goal.
	O'Reilly Autoparts has invested in rooftop solar generation (including some Southwest Missouri stores) and in a project in North Carolina with an annual output of over 52 GWh.
	As part of RE100, Wal-Mart is committed to sourcing 100% of its electricity from renewable energy by 2025. Walmart aims to procure 7,000 GWh of renewable energy globally by 2020.
	Wash U has invested heavily in efficiency and renewables. Wash U is installing nearly 3 MW of rooftop solar across its campuses and has achieved LEED certification for dozens of its buildings.

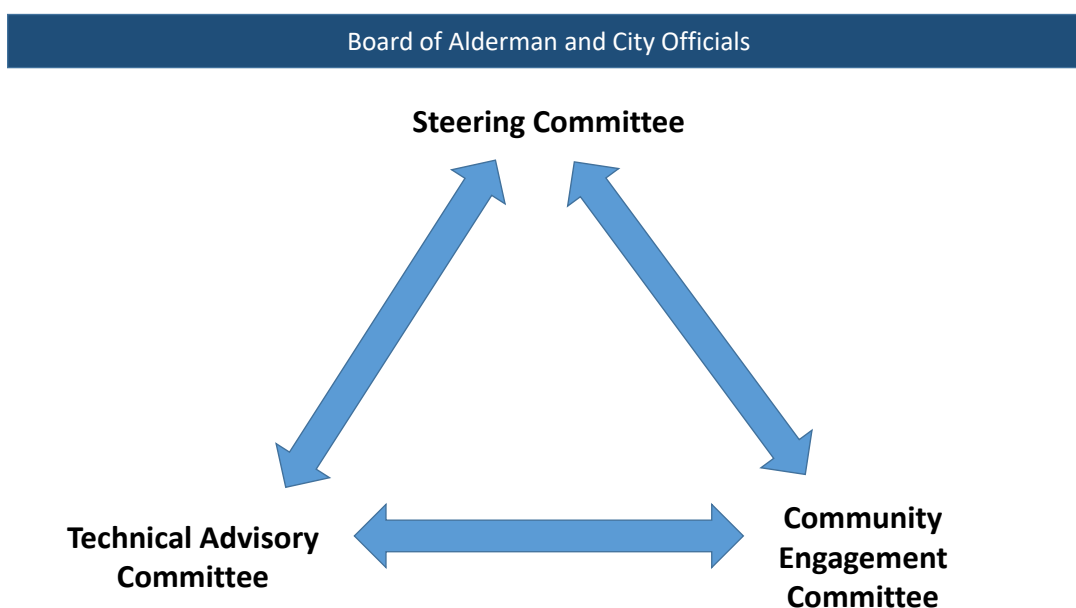
Shading denotes companies that have signed the "Corporate Renewable Energy Buyers Principles".

## Overview and Methodology

Resolution 124 calls for the City of St. Louis to consume 100 percent of its energy from clean energy by 2035. To motivate this goal, the Resolution cites ongoing greenhouse gas emission reduction efforts; energy costs and equity to residents; public health; and economic development efforts. It also requires that this Report and the clean energy goal be developed through a transparent and inclusive stakeholder process which includes community members as well as representatives from organizations representing labor, faith, social justice, environmental justice, frontline communities and those most impacted by our current energy systems, public health and the environment, economic development, utility sector, clean energy sector, universities and academic institutions, business, housing, employment services, low income advocates, government, and any other relevant groups (see Appendix A for details on the public engagement process).

As part of the Resolution 124 process, the St. Louis Board of Aldermen and Board President Lewis Reed established a Clean Energy Advisory Board, a Community Engagement Committee, and a Technical Advisory Committee. These three committees each provided input into the process in an iterative fashion, working together to prioritize and rank relevant strategies and tools against actionable goals.

**Figure 3: Resolution 124 Process and Committees**



**The Clean Energy Advisory Board set the following goals for meeting Resolution 124:**

- **COST-EFFECTIVENESS:** Meet electricity needs in the most cost-effective manner possible or lead to cost savings for consumers over the life of the project
- **JOB:** Create additional employment opportunities for residents that meet or exceed the City's required M/WBE requirements
- **HEALTH:** Improve local health outcomes and health impacts associated with the generation of electricity
- **EQUITY:** Ensure equitable access for low-income communities, communities of color, and other traditionally marginalized groups
- **EMISSIONS:** Reduce carbon emissions and harmful pollution from power plants

The Technical Committee met numerous times over 18 months to develop a candidate list of strategies and programs that could be used to meet Resolution 124. The Technical Committee relied on publicly available data and models to help quantify where possible the net costs of each strategy and the benefits of avoided health measures. These quantitative results, in part, were used to help score each strategy relative to the stated goals of the Advisory Board.

There are multiple tools and strategies that could be used to achieve 100% renewable energy both on the demand and supply side and each opportunity has its own impact on costs and savings, health and equity issues, job creation and emission reductions.

Because the Clean Energy Advisory Board adopted goals in addition to cost-effectiveness, there may be instances when the City decides to procure additional clean energy above and beyond the total economic potential, based on other non-economic benefits.

For each resource, the Technical Advisory Committee developed an estimate for the range of potential net costs to procure resources at an aggregate scale needed by the City of St. Louis. To get the most accurate picture, however, an individual, project-specific analysis will need to be done. The City of St. Louis should conduct its own financial analysis when evaluating individual projects, or issue requests for proposals (RFP) from qualified third parties.

The Committee also evaluated the cost-effectiveness of the City Operations strategies – the extent to which the costs outweigh the monetary benefits or vice versa. The Committee separately considered the health benefits that are not so easily quantified (see Figures 8 and 9 below).

Net costs were estimated by comparing program costs with program benefits. A range of program costs was estimated using publicly available data from relevant Ameren resource filings (e.g., the 2017 Integrated Resource Plan and the 2018 MEEIA filing) and the 2018 National Renewable Energy Laboratory (NREL) Annual Technology Bulletin (ATB). In the short-run, and from a strict ratepayer perspective, additional energy efficiency and solar projects installed by the City of St. Louis will allow it to reduce its own bill – and to avoid paying the

retail rate for the electricity that it no longer consumes. Over the long term, however, the utility is allowed to collect enough revenue to recover its fixed costs and a return on investment. Any shortfall in revenues will be “trued-up” through future rate increases that would affect all ratepayers or through changes in rate structures that recover a greater portion of revenue from each customer through fixed charges or demand charges. With this in mind, cost savings resulting from energy efficiency and solar installed behind the meter are limited to the reduction in fuel and variable costs that would otherwise be incurred to run the power plants necessary to meet that demand but not necessarily other fixed or demand charges.

Avoided emissions and expected avoided health care costs were quantified using the publicly available EPA Avoided Emissions and Generation Tool (AVERT) and Co-Benefits Risk Assessment (COBRA) Health Impacts tool.<sup>11</sup> These publicly available resources allow for a detailed geographic representation of the power plants within the region that are used to meet electricity demand. By using less energy, or by generating more clean low- to no-emitting resources, harmful emissions are avoided. These reduced emissions translate directly into avoided hospitalizations for asthma-related issues, cardiac issues, and other hospitalizations. These represent real benefits to the Region (which may include nearby counties). In 2015, there were more than 2,000 asthma-related emergency room visits by St. Louis children. Avoided emissions from regional resources also directly affect racial equity. In its “Equity Indicators Baseline 2018 Report” for instance, the City found that African-American children in St. Louis are ten times as likely as Caucasian children to visit the emergency room for asthma-related conditions. This measure received the single lowest equity score among all 72 measures evaluated and presents a real opportunity to make meaningful impacts in disparate health outcomes.<sup>12</sup>

This report examines multiple strategies that could be pursued that would move St. Louis forward on a path to 100% clean energy. This report recommends nine strategies and sub-strategies for City Operations and 14 strategies for Community-Wide actions. The evaluated strategies are not meant to be exhaustive; additional strategies could be examined and pursued in the future. Recommended strategies will need to be explored more fully on an individual basis by City officials before they are implemented.

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<sup>11</sup> See: <https://www.epa.gov/statelocalenergy/avoided-emissions-and-generation-tool-avert> and <https://www.epa.gov/statelocalenergy/co-benefits-risk-assessment-cobra-health-impacts-screening-and-mapping-tool>

In describing COBRA, the EPA notes: “Clean energy policies that reduce or avoid air pollution can enhance air quality and improve peoples’ health and quality of life. For example, exposure to air pollution from fossil fuel-based energy can exacerbate respiratory diseases, like bronchitis and asthma, and cause heart attacks and premature death. Beyond the physical health effects, pollution-related illnesses impose other ‘costs’ on people, such as lost wages or productivity when someone has to miss work or school, the costs of medical treatment and outdoor activity restrictions when air quality is poor.”

“Calculating the value of clean energy policies such as energy efficiency or fuel switching, can help state and local governments consider both the costs and benefits of policy choices and support a balanced decision-making process.”

<sup>12</sup> See: <https://www.stlouis-mo.gov/government/departments/mayor/initiatives/resilience/equity/index.cfm>

## II. CITY OPERATIONS

The following section provides a more detailed discussion of each strategy related to City operations.

The below tables summarize the individual strategies for City Operations. Each has been assigned a policy score for each of the five goals approved by the Clean Energy Advisory Board. Because City Operations deals almost exclusively with City-owned buildings, these strategies do not carry a social equity impact within the broader St. Louis community. Therefore these strategies do not receive an equity score. Strategies focused on community-wide actions (Section III) do carry a social equity impact and do receive a social equity score.

### Energy Efficiency

Energy efficiency, broadly defined, is a reduction in energy usage for the same given end use. There are two primary benefits of energy efficiency. The first is a reduction in total energy use, measured in megawatt-hours (MWh). Reductions in energy use reduce greenhouse gas emissions (GHG) and other criteria pollutants like nitrogen oxides (NOx) and sulfur oxides (SOx) that contribute to asthma and other respiratory illnesses. The second benefit is a reduction in peak demand, or energy use during the busiest hours of the year. A reduction in peak demand reduces or avoids the need for additional energy generating capacity – or the total amount of “steel in the ground” measured in megawatts (MW) – required to make sure that resources can provide enough energy when needed. Historically, system peak occurs each day in the late afternoon, between 4 and 7 pm.






Ameren non-residential customers pay both an energy charge (expressed as \$/kWh) and a peak demand charge (\$/kW). Reductions in energy and demand both lead to bill savings for customers. Different energy efficiency programs offset or save different amounts of energy and capacity. For example, a retrofit of existing streetlights to a more efficient LED will likely save energy but do little to offset peak energy use. In contrast, building energy use that targets heating and/or cooling measures will likely both save energy and reduce peak demand, particularly during summer months.

The benefits of energy efficiency programs depend on their total cost, the expected measure lifetime (how long the installed EE measure is expected to last), and the cost of avoided energy. The cost of avoided energy is based on what power plant would have been turned on but for the reduction in energy use. Reductions during peak periods, when older, less efficient resources would be needed, have the highest avoided costs.

There are two primary types of EE programs: *energy management* or changes in energy use, based on education and change in behavioral use patterns, which can lead to both a reduction in use and a shift in use from peak to off-peak periods; and *an increase in efficiency*, based on

upgrades or retrofits to appliances or other devices, which deliver the same level of service or comfort for less energy. Ameren offers programs under the Missouri Energy Efficiency Investment Act (MEEIA). The City and its residents can take advantage of these.

Described below are the strategies involving Energy Efficiency for City Operations:

Energy Efficiency	Descriptions					
1. Pursue all Cost-Effective Energy Efficiency in City-Owned Buildings	<i>Pursue all cost-effective energy efficiency in City-owned buildings by contracting a third-party provider, such as an Energy Services Performance Contractor (ESPC), who will identify all cost-effective energy efficiency, manage the Ameren incentive program process, and ensure installation of all measures.</i>	4	4	3	n/a	4
1a. Energy Management through Benchmarking and Behavioral Change	<i>Benchmark energy and water use for all municipal buildings; focus on least efficient buildings through strategic energy management and training for maintenance staff in order to improve building performance.</i>	4	1	2	n/a	2
1b. ENERGY STAR Certification for City Buildings by 2030	<i>Seek and achieve ENERGY STAR certification for 100% of all eligible City Buildings by 2030.</i>	4	3	2	n/a	3
1c. Hire Energy Manager in Facilities Division to support EE	<i>Consider hiring or appointing an Energy Manager in the Facilities Division, to support ongoing EE, benchmarking, and energy management efforts.</i>	2	1	1	n/a	2
1d. Training for City Staff and Building Employees	<i>Provide regular O+M and sustainability training for Facilities and other City staff (GPRO, BOC, LEED or other)</i>	3	2	2	n/a	2

### 1. Pursue all Cost-Effective Energy Efficiency in City-Owned Buildings

The term “all cost-effective energy efficiency” refers to the level below which investments in efficiency pay for themselves within a reasonable period of time. Because energy efficiency is the least costly resource to invest in – cheaper than new generation of any kind – it makes sense to maximize one’s investment up until the point that it is no longer cost-effective. This Report recommends that the City of St. Louis should pursue all cost-effective energy efficiency

in City buildings to meet its goal of 100% clean energy in City buildings by 2025. To accomplish this, the City should issue an RFP to seek assistance from a third-party provider, such as an Energy Services Performance Contractor (ESPC), who will identify all cost-effective energy efficiency, manage the Ameren incentive program process, and ensure installation of all measures. The City could consider a retro-commissioning approach, along with efficient lighting, motor and HVAC replacements, envelope measures, and any other measures that can save significant energy and earn a return within a short period of time. In addition, the City has a number of options to consider for financing these energy efficiency improvements to City buildings.

Retro-commissioning or Commissioning (work towards ongoing commissioning) is the process of improving the energy efficiency of existing buildings with an emphasis on significant improvements to equipment and systems. These types of retrofits often require an upfront capital cost for the improvements, with savings provided over the life of the investment. These costs can be offset by incentive payments or rebates from a utility provider or in some instances can be paid over time similar to a loan. These loans can be procured from the utility and paid back through a dedicated charge on the utility bill or through low interest loans from the Missouri Department of Economic Development.

In February 2019, the Missouri PSC approved Ameren's latest three-year energy efficiency plan, known as MEEIA Cycle 3. Ameren is authorized to spend up to \$230 million on energy efficiency programs expected to save nearly 800,000 MWh throughout Ameren's service territory. Once these savings are verified by the PSC, Ameren will be allowed to recover the costs of these programs (and the associated revenues from lost sales) from all of its customers. The PSC requires that Ameren first demonstrate that these EE programs are cost-effective and provide net benefits to all ratepayers, in the form of avoided energy, capacity and transmission charges.

To achieve these savings, Ameren customers commonly install qualified EE measures and file for a rebate. One common method to achieve and verify EE savings, and to receive the rebate incentive, is to work with an Energy Services Contractor (ESCO).

Table 1 quantifies the assumed market potential for energy efficiency within the City of St. Louis, based on the approved Ameren MEEIA filing. It assumes that energy efficiency savings within the City of St. Louis are proportional to total system demand, with market penetration rates (the maximum that can be installed in any one year) based on the ratio of total approved MEEIA savings to total Ameren load, net of non-participating customers. Avoided energy, capacity, and transmission benefits are based on information provided in Ameren's 2017 Integrated Resource Plan (IRP), with avoided energy and net costs and benefits levelized over the assumed measure life with a 4 percent discount rate.

**Table 1: Evaluation of Potential Energy Efficiency Measures, City of St. Louis Operations (\$2018)**

Program	Description	2024 Energy (MWh)	Measure Life	Net Total Cost (\$/MWh)	Net Participant Cost (\$/MWh)	Aggregate Total Costs	Aggregate Participant Costs	Aggregate Benefits	Payback (years)
Standard	Lighting, Appliances	6,238	9	-\$16.51	-\$29.81	\$1,058,267	\$371,496	\$1,910,890	3.1
Retro-Commissioning	Operational Improvements	1,288	6	-\$8.89	-\$29.63	\$237,591	\$88,126	\$301,719	3.8
Custom	Custom applications or large combinations	9,836	6	-\$3.94	-\$23.34	\$1,747,186	\$675,279	\$1,964,827	3.7
<b>Total</b>		<b>17,361</b>		<b>-\$9.94</b>	<b>-\$26.66</b>	<b>\$3,043,043</b>	<b>\$1,134,901</b>	<b>\$4,177,436</b>	

**Notes and Sources:**

[1] Program costs, incentive payments, and incremental MWh savings by program come from Ameren Missouri 2019-2024 Cycle III MEEIA Plan, Appendix A.

[2] Net costs include benefits, calculated as avoided energy and avoided peak (capacity, transmission, and distribution) savings for each program.

[3] Measure life assumptions developed by technical advisory committee values.

[5] Costs represent \$2020 in levelized real terms, with an assumed 4% discount rate and 2.5% inflation rate.

By 2025, cumulative investments in energy efficiency could be expected to save the City of St. Louis nearly 17,000 MWh or 6 percent of the total Resolution 124 goal. If the City of St. Louis paid for all efficiency improvements on its own, without Ameren rebates, it would be expected to save on average \$9/MWh. With rebates and incentives, the net cost would fall to -\$27/MWh, increasing savings nearly three-fold. In total, the City would be expected to spend nearly \$1 million in upgrades after Ameren incentives. These investments would provide nearly \$3 million in \$2020 net present value (NPV) over the measure life of each program.

These investments would be expected to save \$0.6 to \$1.3 million per year in avoided healthcare costs. In addition to the cost and energy savings related to energy efficiency projects, this work also supports local, quality jobs, providing workforce development benefits in the community.<sup>13</sup>

There are multiple EE options, some of which are summarized below. Because these options are additive in nature, the Technical Committee chose to score them individually under an overall strategy of aggressively pursuing all cost-effective EE potential.

### 1.a Energy Management through Benchmarking and Behavioral Change

Benchmarking is the process of tracking energy use on a building-by-building basis and comparing that usage to other buildings, past performance or a baseline. The City passed a Building Energy Awareness Ordinance in 2017, requiring public and private buildings 50,000 square feet and more to report their energy and water usage to the City Building Division annually. The City benchmarked 16 of their largest buildings in this process, but should consider

<sup>13</sup> See ACEEE report “Through the Local Government Lens: Developing the Energy Efficiency Workforce” for more details, at: <https://aceee.org/sites/default/files/publications/researchreports/u1805.pdf>

benchmarking as many buildings as possible in order to better track energy usage and identify opportunities for improvements.

According to a report from the US Environmental Protection Agency, buildings that consistently track and benchmark their energy use do save energy. The report, *Data Trends: Benchmarking and Energy Savings*, shows that buildings see an average energy savings of 2.4% annually, with a total savings of 7% over the course of three years.<sup>14</sup>

For example, through the benchmarking process described above, the City of St. Louis was able to identify low performing buildings among the 16 benchmarked and make a plan for improvement. The City Justice Center, the Police Headquarters, the Juvenile Courts Center and the Carnahan Courthouse will be retro-commissioned. And the City Justice Center will also have lighting upgraded to LEDs along with other equipment replacement. The projects will be funded by the Missouri Division of Energy's Revolving Loan Fund.

To sustain these energy savings, other studies have found that benchmarking, and energy efficiency measures informed by benchmarking should be complemented with additional staff training, particularly for operations staff. Notably, through the City Energy Project, the City was able to leverage a GPRO (Green Professionals Buildings Skills Training) Operations & Maintenance "Train the Trainer" program. After getting 12 trainers approved in July 2018, the City and USGBC-Missouri Gateway Chapter have provided O+M training for 23 Building Division staff. Additional trainings are scheduled throughout 2019.

As it relates to City operations and energy use, it is important to recognize that the City has ordinances in place that: 1) require LEED Silver certification for City-owned new construction projects over 20,000 square feet (Ordinance 67414); and 2) require analyzing energy consumption, long-term operating costs and possible energy efficient measures for all new municipal construction or major remodels of municipal buildings, including equipment replacement (Ordinance 67803). Given their importance in incentivizing energy efficiency, this Report recommends that both of these ordinances should be revisited and updated.

These activities are also connected to the Climate Action & Adaptation Plan: Mitigation Strategy 1.3 (Build an Energy Efficient City: Make Green Building the Standard Practice) – Continue the Municipal Energy Efficiency & LEED Standards Ordinances

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<sup>14</sup> [https://www.energystar.gov/sites/default/files/buildings/tools/DataTrends\\_Savings\\_20121002.pdf](https://www.energystar.gov/sites/default/files/buildings/tools/DataTrends_Savings_20121002.pdf)

## **The City Energy Project: Success with Energy Benchmarking**

The City Energy Project (CEP) is a national initiative to create healthier and more prosperous American cities by improving the energy efficiency of buildings. Working in partnership, the Project and participating cities support innovative and practical solutions that reduce pollution, boost local economies, and create healthier environments. The pioneering actions of the 20 leading cities in the City Energy Project are shaping and defining next-generation energy efficiency efforts in communities nationwide. St. Louis is 1 of 20 cities in the City Energy Project. The City Energy Project is a joint initiative of the Natural Resources Defense Council (NRDC) and the Institute for Market Transformation (IMT). It is funded by a partnership of Bloomberg Philanthropies, the Doris Duke Charitable Foundation, and The Kresge Foundation.

Reducing energy use in buildings through energy efficiency measures has an array of benefits that range from job creation and utility bill savings to environmental benefits and improved health conditions for people in the community. The City of St. Louis Sustainability Plan identified programs that result in energy efficiency as a key sustainability objective in realizing these many benefits. Building owners and operators are usually the ones making the decision whether to implement efficiency measures; an energy benchmarking ordinance ensures that the owners and operators of the largest buildings in St. Louis have the energy information they need to make informed decisions. Requiring large buildings to benchmark and report their energy use on an annual basis has been shown to be an effective driver of behavioral, operational and capital improvements to building energy performance. The “Building Energy Awareness” Ordinance was passed on January 27, 2017 by unanimous decision and signed into law on February 16, 2017. This ordinance requires municipal, institutional, commercial, and multifamily residential buildings whose square footage is equal to or greater than 50,000 to track and report their energy and water usage annually to the City’s Building Division.

Benchmarking and transparency ordinances offer a pathway to identify under-performing buildings that may benefit from energy efficiency. This means that the groundwork being laid by the “Building Energy Awareness” Ordinance can provide further opportunities to engage building owners around efficiency, and even to develop new and creative efficiency programs that combine the outreach abilities of cities and community partners with the technical and financial resources of utilities.

Due to the rapid implementation of the benchmarking ordinance, the City has experienced a multitude of milestones:

- Hit a compliance rate of 61% for the 2017 reporting year without levying financial penalties. Goal is to reach 80% for the 2018 reporting year.
- 3 municipal buildings achieved ENERGY STAR certification in 2017 as a direct result of benchmarking: City Hall, Carnahan Courthouse and 1520 Market.
- Established a formal Benchmarking Implementation Advisory Group that meets quarterly to help support the City on its implementation and outreach for the energy benchmarking ordinance.
- Established the USGBC-Missouri Gateway Chapter as the City’s primary outreach and education partner on benchmarking, educational opportunities and local efficiency resources.
- Secured a \$1.3M loan from the Missouri Division of Energy’s Loan Program to conduct retro-commissioning and other efficiency upgrades to 4 municipal-owned buildings. Work began in 2019.
- In 2019, Ameren Missouri will offer automated data transfer to all customers in their service territory. Tool will allow automated data transfer of monthly electric usage data directly into customers’ ENERGY STAR Portfolio Manager accounts.

1.b. Seek ENERGY STAR certification for 100% of all eligible City buildings by 2030

In addition to identifying opportunities for building energy efficiency improvements, the benchmarking process helped the City recognize buildings that are performing well. City Hall, Carnahan Courthouse and 1520 Market all earned an ENERGY STAR rating of 75 or above, making them eligible for certification. All three buildings were verified and received an ENERGY STAR certification for 2017. This means they are performing in the top 25% of similar buildings. The City should continue this effort for all eligible City buildings.

1.c. Hire or appoint an Energy Manager in the Facilities Division, to support ongoing EE efforts

An Energy Manager within City government would allow for increased coordination and implementation of multiple energy efficiency programs.

1.d. Provide regular Operations & Maintenance and sustainability training for Facilities and other City staff (GPRO, BOC, LEED or other)

Training of building operators can be tied to energy savings. According to the Northwest Energy Efficiency Council's evaluations of the Building Operator Certification training, attendees that use energy-efficient procedures and tools learned in the class can save 100,500 kilowatt hours and 1,400 therms annually.<sup>15</sup>

Training should include a focus on implementing Operations and Maintenance best practices, which can help owners save 5–20% on energy bills annually, according to a report by ENERGY STAR.<sup>16</sup>

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<sup>15</sup> <https://www.theboc.info/wp-content/uploads/2017/02/BOC-Energy-Savings-FAQ-2.0-web.pdf>

<sup>16</sup> <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/save-energy/comprehensive-approach/operations-and>

## ***Cool Roofs***

Reflective roofing is an efficiency measure that can significantly reduce summer cooling energy costs on the top floor of a building. “Cool roofs” or “white roofs” also mitigate the heat island effect in the same manner as sea ice, by reflecting solar radiation back to space (the albedo effect). A white roof on a large commercial building can save thousands of dollars a year in energy costs while reducing peak demand.

A cool roof can be as simple as turning a flat asphalt roof white with a sprayed coating or a membrane. Shingles and other reflective materials are available for sloping roofs as well, and they are not necessarily white. The cost of most cool roofing materials is roughly the same as for non-reflective roofing.

Cool roofs are a low-cost measure for City government buildings, especially older (pre-1980) buildings. The energy and cost savings available for a particular roof can be estimated using a calculator such as the Roof Savings Calculator or Cool Roof Calculator, both developed by Oak Ridge National Laboratory.

Cool roofs can also be employed community-wide. Some cities and states have added cool roofing to their building and energy codes. It has been part of the International Energy Conservation Code since 2012 for new construction and major renovations; the City has adopted this code. White roofs are a better choice than green roofs when emissions reduction is the goal. Green roofs save more energy costs due to the cooling effect of evaporation and the insulating effect of their growth medium. However, they cost much more to install, demand a stronger roof, and have only one-third of the solar reflectance of white roofs. The summer cooling effect of white roofs becomes a heating penalty in winter, but this is only a small fraction of the cooling benefit.

St. Louis should coat all suitable City roofs white whether or not they will receive solar panels. This measure should be encouraged in the community at large and supported by incentives when funding is available.

The City of St. Louis has a long track record of investing in energy efficiency measures for its buildings over the years – from high efficiency lighting and HVAC projects to retro-commissioning. Most recently, for example, the Facilities Management department worked to retrofit the City Hall parking lot with LED bulbs, a change which resulted in an 85% reduction in electric usage.<sup>17</sup> Energy efficiency investments typically require an upfront capital investment to purchase new supplies or materials and pay for labor to install and implement the new programs. These capital investments then save energy and operating expenses for many years into the future. As described above, cost-effective energy efficiency measures have the potential to conservatively save the City up to \$500,000 a year in avoided costs and should be considered a priority in the capital budgeting process.

Given the estimated returns available to the City, it is particularly important to consider options available outside of the capital budgeting process to finance these new investments. These

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<sup>17</sup> See the City of St. Louis Climate Action & Adaptation Plan, April 2017 for a more detailed analysis and description.

options include: direct low cost loans from State and Federal Partners; contracts with third party providers; and utility on-bill financing. All three options provide a different way to dedicate savings to future investments in clean energy. “Revolving loan funds” can be important to building and sustaining incremental progress.

**Partnership Loans:** Recent projects have been funded by the American Recovery and Reinvestment Act of 2009 and the State of Missouri’s Energy Loan Program.<sup>18</sup> Missouri’s Division of Energy offers low-interest loans (less than the City’s own 4 percent cost of capital) for energy efficiency projects to state and local governments as well as schools (K-12 and higher education) and hospitals. Loans are meant to be paid back to the state with the savings from energy use reduction. In 2018, the City’s Facilities Division was approved for over \$1.3 million dollars in energy efficiency upgrades for the City Justice Center, St. Louis Metropolitan Police Department Headquarters, Juvenile Courts Center, and Carnahan Courthouse, including retro-commissioning for all four buildings and lighting and equipment upgrades for the City Justice Center. The payback, or return on investment for these projects, is estimated to be just 2.7 years. The City Street Department has also taken advantage of the Energy Loan Program to upgrade street lighting to LEDs.

According to National Public Radio in April 2017,<sup>19</sup> the City estimates saving \$150,000 a year with lighting upgrades funded by the Energy Loan Program. Applying for these loans, however, can require significant up-front effort by the City or a third party contractor to identify potential projects and then complete the loan process. Without a guaranteed contract or loan, the City or other partners may not be able to consistently afford the required up-front work necessary to obtain these loans.

**Performance Contracts:** Another route to fund energy efficiency improvement in City buildings is to use an Energy Savings Performance Contract, working with an Energy Service Company (ESCO). According to the U.S. Department of Energy, public sector Energy Savings Performance Contract projects show an average energy savings of 13% – 31%.<sup>20</sup> In this model, the ESCO is responsible for developing an energy savings plan (usually starting with investment-grade audits of buildings), facilitating financing, and installing energy efficiency upgrades. Energy savings are guaranteed and used to pay for the upgrades over time. The main advantage of an Energy Savings Performance Contract is that there is no up-front cost to the City. Additionally, cost and energy savings are guaranteed, and the ESCO serves as the single point of contact, overseeing project design, construction, post-installation monitoring and evaluation.<sup>21</sup>

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<sup>18</sup> <https://energy.mo.gov/assistance-programs/energy-loan-program>

<sup>19</sup> <https://news.stlpublicradio.org/post/st-louis-replacing-streetlights-says-it-will-save-money-and-energy#stream/0>

<sup>20</sup> For more information, see: <https://betterbuildingssolutioncenter.energy.gov/energy-savings-performance-contracting-espc-toolkit>

<sup>21</sup> For further comparisons between Energy Savings Performance Contracting and Design-Bid-Build, see this US DOE chart: [https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/ESPC\\_DBB-1pgr.pdf](https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/ESPC_DBB-1pgr.pdf)

**On-Bill Financing:** Another route is to partner with a local utility to develop some form of on-bill financing, where the utility pays for the upfront cost of the energy efficiency measure and then is repaid by customers through the monthly billing cycle. These programs, often known as “pay as you save” (PAYS) are not currently available in Missouri, but have been implemented in many locations around the country. This type of on-bill financing allows for stable and predictable bills and for energy efficiency to be installed with no up-front, out of pocket costs. This model acts as a type of revolving loan fund by using future savings to fund current projects. One challenge with this model is the necessary and extensive evaluation, measurement and verification (“EM&V”) work necessary to verify that installed measures generate the estimated savings.

As the City continues to invest in energy efficiency for its buildings and to reduce energy costs, it is important to realize that efficiency is a long-term investment. Buildings will always need to be maintained, repaired, and updated. The City can lead by example by continuing to invest in its building stock. As the City continues to implement successful energy efficiency projects, it will be important that capital investments don’t penalize the annual operating budgets of individual departments. Instead, the City should continue to pursue strategies, such as the methods outlined above, that help reinvest energy savings into future and ongoing high performance design, operations and maintenance, and occupant behavior projects within affected departments consistent with a path towards continued improvement.<sup>22</sup>

## Solar

Like energy efficiency, distributed solar is a local resource that requires local installation and labor, and reduces energy load from fossil resources that serve the immediate St. Louis area. Installing the first 5 MW of the total 20 MW technical potential could lead to an additional \$200,000 to \$500,000 in regional avoided health costs.

Between 2009 and 2018, the price of utility-scale solar fell 88%, faster than any other renewable resource.<sup>23</sup> Photovoltaic (PV) panels produce energy from the Sun. Energy production is greatest during the summer months, when days are longer and the solar irradiance is stronger. In Missouri, a solar panel can be expected to produce energy with an average capacity factor of 14 to 18 percent. This means that a 1 MW panel will produce approximately 1,400 MWh over the full 8760 hours in a year.

There are different types or scales of solar energy that could be used by the City of St. Louis. Large solar arrays or utility-scale solar, owned by Ameren, is likely to be the lowest-cost solar






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<sup>22</sup> Harvard University’s Green Revolving Loan Fund is a good example of what is possible. Since its inception, Harvard’s fund has supported 200 projects with over \$4 million in annual energy savings. See: <https://green.harvard.edu/programs/green-revolving-fund>

<sup>23</sup> Lazard’s Levelized Cost of Energy Analysis Version 12.0, <https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf>

resource, with the benefits shared by all Ameren service customers. When and if Ameren adds solar, it will have a slight effect on the City's percentage of clean energy. Future additions of solar by Ameren will depend on a number of factors, including customer demand.

However, solar owned or controlled by the City is a much more direct way for the City to meet its clean energy goal. Below, we consider the various models in which the City can construct or control its own solar generation.

Solar	Descriptions					
2. Install Rooftop Solar on a Portfolio of City-Owned Buildings	<i>Pursue City ownership or lease of cost-effective rooftop solar on City-owned structures, likely through an annual lease structure with partners able to monetize federal tax credits.</i>	3	3	1	n/a	3
3. Consider Ameren Solar Partnership Program	<i>Coordinate and collaborate with Ameren Missouri for installation of new utility-owned solar generation on City-owned property, including buildings and land.</i>	1	3	1	n/a	1

## 2. Install Rooftop Solar on City-Owned Buildings

Customer-owned rooftop solar offers many benefits, including the ability to avoid consuming fossil fuel-based energy from utilities and the possibility of saving money each month after the solar system has been paid off. While there is a significant cost involved, the price to install distributed rooftop solar has declined sharply in recent years. In addition, several incentive programs exist to help defray installation costs, such as the federal Investment Tax Credit (ITC) and Ameren Missouri solar rebates mandated by the State of Missouri. The net cost to install distributed solar will depend on a number of factors, including site-specific resource availability and sun exposure, total system size, and the ownership structure.

There are generally two ways that the City may acquire rooftop solar: 1) City-owned, where the City purchases a completed system turnkey from a developer, or 2) third-party-owned where a developer owns the system and the City pays for its use (i.e. lease). This ownership structure matters for what incentives the City can qualify for and whether the City is able to sell its excess energy back to the grid at the full retail rate.

City-owned solar systems under 100 kW would qualify for "net metering" credit. Missouri's Net Metering and Easy Connection Act ("net metering") allows customers to install rooftop solar

and receive credit for excess generation they feed back to their utility.<sup>24</sup> Ameren credits the customer's bill at the full retail rate during the monthly billing period; any net excess generation beyond that month's usage will be credited by the utility at its avoided cost rate, which is much lower than the retail rate. Ameren currently forecasts its avoided costs will be close to \$23/MWh on average in 2019.<sup>25</sup>

Rooftop solar systems may of course be much larger than 100 kW, but the systems should be sized for the generation to be used behind the meter. The City may even choose to construct a large solar farm and take service under Ameren's "Qualified Facilities" or "Cogeneration" tariff. This tariff provides certain customer-generators a standard rate for purchases from systems up to 500 kW in size.<sup>26</sup> The tariff is intended to enact the standards of the federal Public Utility Regulatory Policies Act ("PURPA") that requires utilities to purchase renewable energy from "qualified facilities" (QFs) at the utility's "avoided cost," or the cost the utility would have incurred to otherwise procure the energy.

City-owned rooftop solar will require capital expenditures to purchase the system, and the City would need to carefully consider the budgetary implications and challenges. Despite the immediate nature of the capital outlay, the City's internal funds/bond-making authority would enable this to be financed at a lower cost of capital than a third-party owned system. However, as a tax-exempt municipality, the City would be unable to capture the federal Investment Tax Credit (ITC) available for solar, which defrays 26% of system cost in 2020. For many systems, these benefits can be a key financial driver and make systems cost-effective. It may be possible for the solar installer company to monetize the ITC credits, or for the City to work with a tax equity partner for a period of time. In addition, the City may consider various alternative financing options, such as Missouri's Environmental Improvement and Energy Resources Authority (EIERA).<sup>27</sup>

If the City is considering installing its own solar – whether rooftop net-metered systems or large utility-scale systems – it should contract with a large solar company to prepare an engineering and financial analysis of each proposal. In addition, the Technical Committee can help to prepare proposals or vet the various options available.

Based on analysis of available rooftop space, the technical potential for rooftop solar in St. Louis is approximately 20 MW (See Appendix B). At this level of technical potential, rooftop solar could deliver up to 28,000 MWh per year, or approximately 10 percent of the Resolution 124 goal for City operations. As a simplifying assumption, this Report assumes that approximately 25% or 5 MW of this capacity would represent the economic potential of solar for the City of St. Louis. This target is consistent with aggregate installations of solar on commercial properties in the St. Louis region in recent years. To achieve the optimal price from

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<sup>24</sup> Section 386.890, RSMo, *Net Metering and Easy Connection Act* (2007).

<sup>25</sup> Ameren Missouri 2017 Integrated Resource Plan, EO-2018-0038, Chapter 7: Appendix A, pg. 4.

<sup>26</sup> <https://www.ameren.com/-/media/rates/files/missouri/uecsheet170eppqfcogen-old.pdf>

<sup>27</sup> <http://eiera.mo.gov>

a solar installer company, the City should identify all of the most solar-ready buildings and solicit bids for a single aggregated project.

In contrast to a City-ownership model, the City should consider leasing solar panels from a third-party owner. The primary value of such a model is the lack of upfront costs to the City. The third party would offer a lease rate to the City, which ideally would be lower than the building's current energy costs, and nearly eliminate energy costs once the system is paid off and transferred to the City. Because the City would not initially own the solar in this arrangement, it is possible the third party would be able to make use of the otherwise disallowed federal ITC and accelerated depreciation. If so, the subsidized cost of system would in part be passed through to the City through a lowered cost of energy. Leased systems do not currently qualify for net energy metering credits in Missouri, and all energy would need to be used on site. However, sizing the systems correctly may allow for nearly all energy produced to be consumed on site during business hours.

Such an ownership structure would also require additional transaction and structuring costs, with increased execution risk given the reliance on external partners. These transactions often, though not always, involve multiple counterparties. This includes the developer who will own the system as well as its potential financial counterparties who help finance its construction such as lenders and tax equity investors. The coordination of these multiple parties can often take many months to execute. Though the City need not pay for the construction of the system, the additional financial counterparties will each extract value from the transaction.

**Figure 5: Net Costs of Solar, by Ownership Model, Incentive Payment and Benefits**

Net Costs of Solar, by Ownership Model, Incentive Payment and Benefits			
	Net Cost (\$/MWh)		
City Ownership	Low	Med	High
Avoided Energy Wholesale Cost, No ITC		\$68.31	
Retail Cost, No ITC		\$25.68	
Retail Cost, with ITC		(\$24.91)	
Lease	Low	Med	High
Avoided Energy Wholesale Cost, With ITC	\$29.52	\$47.02	\$61.77
Retail Cost, with ITC	(\$24.79)	(\$7.28)	\$7.46
Utility Ownership	Low	Med	High
Avoided Energy Wholesale Cost, With ITC	\$1.32	\$5.60	\$12.72

**Notes and Sources:** Cost estimates are based on the 2018 NREL ATB, for a representative solar system installed in Kansas City (ATB reports data for Seattle, Chicago, KC, and Los Angeles). Cost estimates include both "Solar Utility PV" and "Solar PV Dist. Comm". All costs are initially expressed in \$2016, and converted to \$2020 assuming a 2.5% inflation factor. Costs are based on a 2020 installation year, and include a 30% investment tax credit. Net costs to the City are based on a 20-year lease or financing structure, but assume a 30-year asset life. Lease payments or PPA rates are assumed to be equal to the NREL ATB levelized cost of electricity. Avoided benefits are based on Figure 4, above.

Figure 5 illustrates the wide range of potential costs. Across all cases, City ownership is expected to be the most expensive option, particularly given the inability to monetize the 30 percent federal investment tax credit. If the City could use the tax credit, the net cost (including avoided retail rates) would be positive – with an approximate 12 year payback and 4.5 percent internal rate of return.

For systems located on City property, but procured through a lease with a third party provider, the net costs to the City would range from -\$24.79/MWh to \$7.46. This suggests that there are cost-effective opportunities to install new solar on City owned buildings. The most cost effective arrangement will be with systems that are sized to meet building energy load – but no more. The best candidates are likely to be the largest energy-using buildings/accounts, with large rooftops. Note that at the lower marginal or avoided cost measure, leased solar on City-owned buildings would impose a net cost of \$29 to \$61/MWh. Another implication is that the economics of leased projects on City owned rooftops will be sensitive to long-run assumptions about rate structures and retail rates, which may or may not hold constant for the next 20 years. In contrast, utility-owned solar (including avoided costs) could represent a much lower-cost method to procure solar energy, due to the economies of scale and buying power and expertise of the utility. The benefits of utility-owned community solar, including low-income participant programs, is discussed more fully in Section III (Community-Wide strategies) of this report.

#### *Rooftop Solar at Washington University in St. Louis*

Washington University has recently installed a new 546-kW rooftop solar array at its North Campus location. The project was set up through a service agreement structure that could act as a model for municipal buildings or for commercial buildings in the City. The University is working with Azimuth Energy, Aschinger Electric, and Gardner Capital, who financed the system and will retain ownership for 20 years. The University only incurred minor up-front costs for project management and roof repair and will pay an annual service fee for the clean energy produced by the solar array, which will reduce the University's annual electric bill by approximately the same amount. In short, the project is nearly cost neutral in year 1 and is projected to save roughly \$90,000 over 20 years. In fall 2019, an additional 205 kW of rooftop solar will be installed on North Campus following summer roof replacements. When complete, the solar array is expected to produce over 25% of the annual electric usage at the North Campus location, saving over \$100,000 over 20 years. The University will also have the option to buy the system any time after 7 years. Notably, the University sees the new rooftop solar array as an important part of its sustainability commitment and as a competitive investment that will save money over time for the University to direct to other purposes.



### 3. Ameren's "Solar Partnership" Program – NOT RECOMMENDED

In January 2019, Ameren announced its first project under its new "Solar Partnership Program" and will install a 1.8 MW system on the parking garage at the BJC Healthcare campus. Under the program, Ameren owns and operates this system to the benefit of all customers in the region, and BJC licenses its property to Ameren for the new facility.<sup>28</sup> Ameren retains the RECs as part of its own renewables commitment. If the City participated in this program, it would be unable to count RECs toward its own 100% clean energy goal even for solar installed on its own buildings; to do so would be to double-count RECs Ameren had already claimed. For this reason, the City's participation in the Ameren "Solar Partnership" program scores poorly in terms of the percentage of energy/CO2 savings (Goal 1).

***This Report does not recommend that the City participate in Ameren's Solar Partnership program as a strategy for achieving its 100% clean energy goal.*** Because no RECs transfer to the host property, the City will not be able to meet any of its own electricity demand through this program. This is not to say that the program is without value. On-site solar is often the most visible and tangible marker of progress towards any renewable energy goal, and it can play an important part in education and raising awareness. If the City thinks there is a high value in having visible solar on City buildings, it could pursue a partnership with Ameren under this program. However, it will have little direct impact toward accomplishing the goal of 100% clean energy in City Operations by 2025.

## **Wind**

As with solar, the cost of wind has fallen rapidly, by nearly 70% percent since 2009.<sup>29</sup> In many regions of the country, new wind resources are beating new natural gas fired generation on a levelized cost of energy basis.<sup>30</sup> Wind resources that are placed in service before 2021 also qualify for the production tax credit, which offers an incentive payment on a per MWh basis for electricity generation. Wind resources may also elect to take the up-front investment tax credit by 2022.

Given these falling prices and expiring tax credits, it is no surprise that utilities across the Midwest have aggressively added new wind resources. In Missouri, utilities have announced

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<sup>28</sup> <https://www.constructforstl.org/ameren-bjc-partner-to-bring-new-solar-energy-to-st-louis/>






<sup>29</sup> <https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf>

<sup>30</sup> The levelized cost of energy (LCOE) is a metric for comparing the cost of different resources, but it may not fully reflect the value of each resource to the electricity grid. For example, the LCOE does not capture the environmental benefit of carbon-free generation from wind resources. Nor does it capture the capacity and reliability value of a dispatchable resource such as a natural gas-fired generator.

plans to add more than 1,000 MW by 2020, the fastest expansion in renewable generation in the State's history.

These investments in new wind have created nearly 36,000 jobs in the Midwest.<sup>31</sup> This sector is considered one of the fastest growing employment hubs in the region, with starting salaries typically above the median pay.

Distributed wind resources owned behind the meter do exist, but they have little viability in an urban setting. This Report focuses on utility-scale wind resources. These can be used to serve a much greater energy load, often at a lower total price. The City of St. Louis has two primary options to procure additional wind power: the Ameren Renewable Choice green tariff program and Virtual Power Purchase Agreements (VPPA).

Wind	Descriptions					
4. Regional Wind Procurement	<i>Participate in Ameren Missouri's "Renewable Choice" (Green Tariff) program to procure new, additional wind resources directly from Ameren Missouri to meet some or all of the City's electricity demand.</i>	2	2	3	n/a	4
5a. Regional Virtual Power Purchase Agreement	<i>Contract for a "Virtual Power Purchase Agreement" from wind resources located near the St. Louis region, from Ameren, or from the MISO Regional Transmission Organization.</i>	2	2	3	n/a	4
5b. Remote Virtual Power Purchase Agreement	<i>Contract for a "Virtual Power Purchase Agreement" for new wind energy from outside of Ameren and the MISO Regional Transmission Organization.</i>	4	0	0	n/a	3
6. Purchase "Unbundled RECs"	<i>Consider purchasing low-cost "unbundled" Renewable Energy Credits (RECs) to meet the City's goal.</i>	0	0	0	n/a	0

#### 4. Regional Wind Procurement through Ameren's "Renewable Choice" Program

The Ameren green tariff or "Renewable Choice" Program was approved by the Missouri Public Service Commission in August 2018 and formally launched in October 2018. Under the program, Ameren will help procure up to 400 MW of new wind located in Missouri or

<sup>31</sup> <https://www.e2.org/reports/clean-jobs-midwest-2019/>

elsewhere in the Midwest, for interested corporate and municipal customers. These wind resources may be built by merchant owners that sell the power to Ameren, or Ameren may build and own up to 200 MW. Only green tariff customers, not other ratepayers, will pay for this wind.

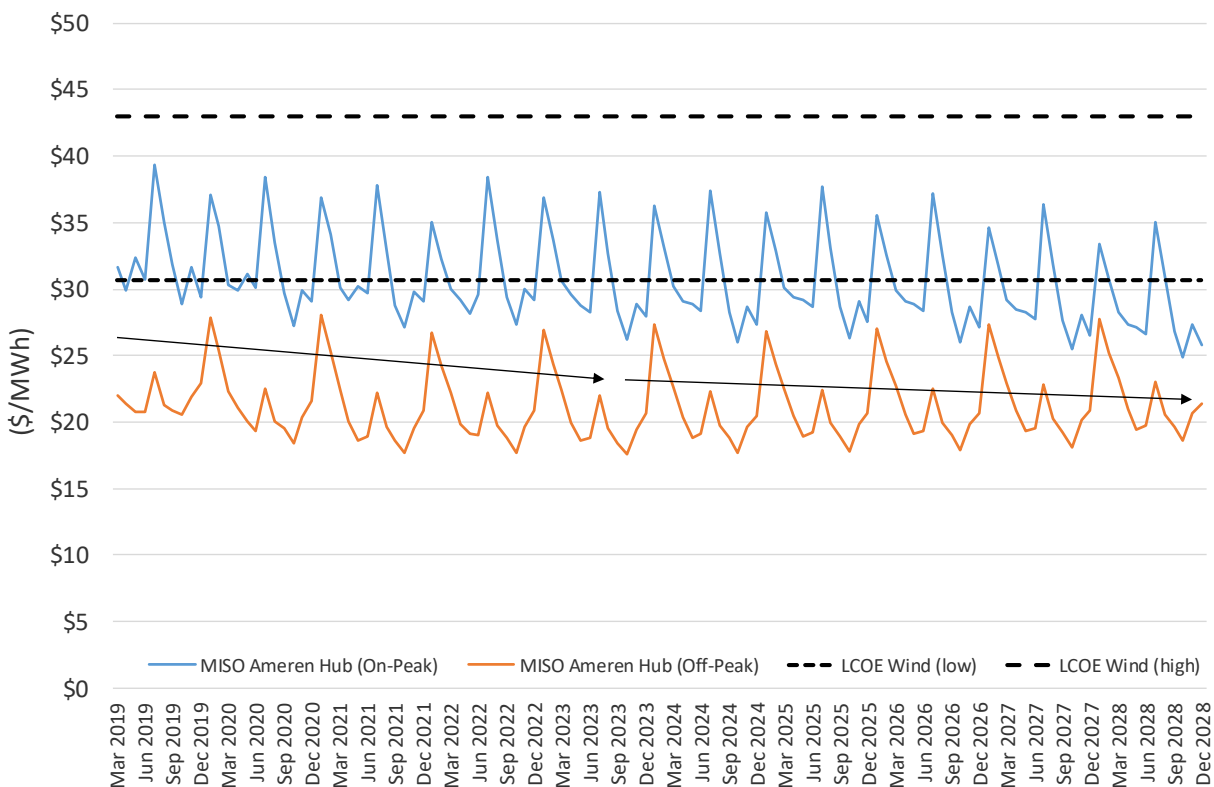
The green tariff represents the largest single opportunity to procure additional clean energy. The City could take credit for new, additional resources in the MISO region. Adding up to 50 MW of wind used to power St. Louis City operations could create additional regional jobs and avoid between \$7 and \$15 million in health care costs for the region. Purchases through the utility procurement program would likely be among the most administratively simple options available to the City.

Ameren is developing the green tariff in several stages. In winter 2018, Ameren sought non-binding letters of interest from qualifying customers to gauge market demand. With this total demand (up to the 400 MW limit), Ameren issued a competitive solicitation for new resource bids. These bids will be used to establish a contract price for new wind energy under the tariff contract. The City of St. Louis is among several large corporate or institutional customers who expressed interest in meeting some or all of their electricity needs through the program.

Interested buyers sign a 15-year contract with Ameren for the environmental attributes associated with the wind energy. Consumers continue to pay the energy charge on their utility bills, plus the tariff cost for new wind energy. The green tariff cost is set as the difference between the 15-year contracted wind rates (levelized cost of new wind) minus the wholesale market revenues of that wind resource within MISO (levelized market revenues of new wind). In essence, the long-term green tariff contract provides additional revenues to new wind developers above total market revenues, such that new resources exactly recover their costs. In this sense, the green tariff is similar to signing a 15-year contract for RECs from new wind resources located in Missouri or nearby. This market certainty allows new resources to enter the market. Over the life of the asset, if energy market revenues exceed the levelized costs, green tariff customers would receive a rebate on their utility bills.

Figure 6 shows the currently monthly power forwards for wholesale market prices in MISO at the Ameren Hub, for monthly average on- and off-peak periods, for the period out to 2028. Also shown are the levelized cost of new wind resources, from the NREL 2018 ATB. For the foreseeable future, the levelized costs of new wind resources – while more cost-competitive than new thermal generating power plants – will still be more than expected energy revenues. That is, wind resources will have “missing money” that will need to be met through the sale of its RECs or through capacity markets. Assuming that power prices continue to grow at the five-year rate observed in the latter half of this period, the net cost of RECs procured from wind resources located in MISO would be between \$8/MWh and \$22/MWh. Based on mid-point estimates, the net cost (measured as levelized costs/PPA costs minus expected energy market revenues) would be \$15/MWh. This is comparable to the cost of procuring RECs from existing wind resources in the MISO region.

**Figure 6: MISO Monthly On- and Off- Peak Power Forwards (\$/MWh) with the LCOE of new Wind Resources**



Source: Power Forwards (S&P Global Holdings), as of March 2019. LCOE based on NREL ATB 2018, expressed in real \$2020.

## 5. Virtual Power Purchase Agreements

A virtual power purchase agreement (“virtual PPA”) allows large power users to purchase large quantities of RECs from a distinct developer, but without a true transfer of the associated electricity. These agreements create the legal fiction of a PPA, arranging the financing “as if” the energy were delivered to the end user. From a climate perspective, these RECs lead to reductions in global greenhouse gas emissions, to the benefit of all. However, as shown in Table 2, the ultimate GHG benefit of the REC will depend on the avoided energy in each region. Virtual PPAs can be geographically constrained, so that the avoided CO<sub>2</sub> happens across a particular region or regional transmission organization. Given the relatively cleaner generation resources from a rapid expansion of wind and natural gas resources in the Southwest Power Pool (the regional transmission organization, or RTO, in that area), a new MW of wind located in the Southwest would be expected to reduce up to 1,267 lbs of CO<sub>2</sub> per MWh of generation. In contrast, a new MW of wind located in MISO or the upper Midwest would be expected to

reduce up to 1,884 lbs of CO<sub>2</sub> per MWh generation, owing to the greater quantity of coal fired generation in the region.

**Table 2: Avoided GHG rate (lb/MWh) by Region; (EPA AVERT, 2018)**

Avoided CO2 Rate (lb/MWh)				
	Wind	Utility PV	Portfolio EE	Uniform EE
Northeast	1,057	1,074	1,137	1,114
Great Lakes / Mid-Atlantic	1,599	1,602	1,678	1,675
Southeast	1,408	1,466	1,521	1,502
Lower Midwest	1,745	1,666	1,767	1,813
Upper Midwest	1,884	1,787	1,923	1,965
Rocky Mountains	1,606	1,557	1,637	1,672
Texas	1,326	1,267	1,354	1,387
Southwest	1,267	1,267	1,312	1,317
Northwest	1,558	1,590	1,599	1,635
California	1,033	1,050	1,096	1,087

The net costs for a VPPA will differ based on the cost to install a project (depending on regional labor rates), the greater wind availability and higher facility output, and the difference in expected market revenues at the relevant trading hub. Using the same analysis and data sources outlined above, a VPPA located in Texas could range in costs from -\$5.6/MWh to \$6.2/MWh, with a mid-point cost of \$0.1/MWh. That is, based on current market fundamentals – including the use of the production tax credit – corporate entities and other voluntary buyers can often procure RECs through this type of energy hedge at low to no cost.<sup>32</sup> This investment would likely pose significant financial and administrative burdens, require detailed and coordinated third party consultation, and may require specialized accounting under securities exchange laws. A VPPA would provide no regional health benefits, and as described in Table 2, would count less towards the City’s ultimate GHG emission reduction goal. These VPPAs can also be structured as a hedge against both future REC prices and against energy prices in the region of interest. This “contract for differences” approach works similar to the green tariff structure outlined above, but operates in wholesale power markets and does not require the physical delivery of energy.

A VPPA can be developed for any type of renewable resource. Historically, wind VPPAs have been used owing to their larger size, higher capacity factors, and the implications of the production tax credit. More recently, however, corporate partners have identified more cost-effective solar VPPAs, owing to their generation load profile and ability to earn a greater share of relative market revenues during high or on-peak price hours. This Report does not evaluate a solar VPPA because the net costs and considerations are adequately captured to a first order by the preceding wind analysis.

<sup>32</sup> For a detailed discussion, and a comparison of wind and solar VPPA in Texas, see <https://www.greentechmedia.com/articles/read/corporates-millions-on-table-by-procuring-wind-over-solar-ercot>

#### 5a. Regional Virtual Power Purchase Agreements

The City could choose to enter into a virtual PPA for wind generation located near the St. Louis region, or within the MISO footprint. This would allow the City to claim a greater amount of nearby jobs and economic benefits that come with locating large energy projects nearer to the St. Louis community. In addition, the more local the project, the more likely it is that it will help to offset some of Ameren Missouri's coal generation.

#### 5b. Remote Virtual Power Purchase Agreements

In addition to Ameren Missouri's "Renewable Choice" program and a local Virtual Power Purchase Agreement, the City may consider additional virtual power purchase agreements (VPPA) for new wind energy located in regions outside the MISO footprint. These "virtual" power purchase agreements work similar to the green tariff, except the physical energy is delivered to a different power grid and does not offset any generation used to serve demand in Missouri or St. Louis.

In 2017, Anheuser Busch InBev signed a VPPA for 150 MW of capacity with a new wind facility located in Oklahoma that delivers wind energy into the Southwest Power Pool (SPP) rather than MISO. AB-InBev has not announced the financial terms of that deal, but did reveal that as part of the process they evaluated 75 projects with 15 different partners.<sup>33</sup>

#### 6. Purchase "Unbundled RECs" – **NOT RECOMMENDED**

RECs purchased from the voluntary or secondary market are referred to as "unbundled" because they are not linked with the delivery or procurement of electricity; rather they are simply credits that represent that one MWh of renewable energy was created somewhere.

***This Report does not recommend that the City purchase unbundled RECs as a strategy for achieving its 100% clean energy goal.*** Because they are divorced from the resources that created them, purchasing RECs would not change the City's energy mix and would cost the City extra rather than providing a pathway toward lowering energy costs. Furthermore, purchasing unbundled RECs without the associated energy would not create local jobs, have any health impacts, or lead to any equity opportunities.

Unbundled RECs provide the most flexibility of any contracting mechanism and can be purchased on an as-needed basis each year. This flexibility, however, may also come with increased variability in future prices. A variability in pricing may pose budget challenges.

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<sup>33</sup> For more information, see: <https://www.greenbiz.com/article/anheuser-busch-kimberly-clark-amp-wind-power-commitments> and [https://www.stltoday.com/business/local/anheuser-busch-signs-wind-farm-power-deal-as-part-of/article\\_b947910e-ed54-5b34-934a-cb2173388fdb.html](https://www.stltoday.com/business/local/anheuser-busch-signs-wind-farm-power-deal-as-part-of/article_b947910e-ed54-5b34-934a-cb2173388fdb.html)

Voluntary RECs are available through several trading platforms, including the Ameren Pure Power program, which offers RECs from wind farms located in the Midwest.<sup>34</sup> Voluntary RECs purchased through Pure Power cost \$10/MWh but do not replace the energy you currently purchase through Ameren as a retail customer.

Voluntary RECs are available from both existing and new renewable resources located throughout the U.S. Voluntary RECs are typically available for sale from resources for which supply exceeds demand, or in regions where renewable resources can cover their fixed and variable costs from energy market revenues alone. This could happen, for instance, if more renewable energy is generated in a region than is required under a state RPS or regions with low costs and/or high energy prices.

Voluntary RECs from existing resources may not directly lead to new reductions in energy prices or GHG emission, jobs, or avoided health costs. At best, a purchase of existing RECs may indirectly create demand for new resources, since new and existing RECs can both be used by non-regulated entities to demonstrate compliance with a clean energy goal. There is no legal requirement that REC proceeds be invested in new wind development. The National Renewable Energy Laboratory reports that the average price of voluntary RECs was a mere \$0.70/MWh as of August 2018. At this price RECs separated from the energy they represent (“unbundled” RECs) are entitled to no credit as a claim on renewable energy use. The Corporate Renewable Energy Buyers’ Principles therefore insist on “additionality,” meaning that RECs must represent new wind energy being brought on line. Without some form of additionality comparable to power purchase agreements or virtual PPAs, unbundled RECs cannot be considered clean energy as defined in Resolution 124.

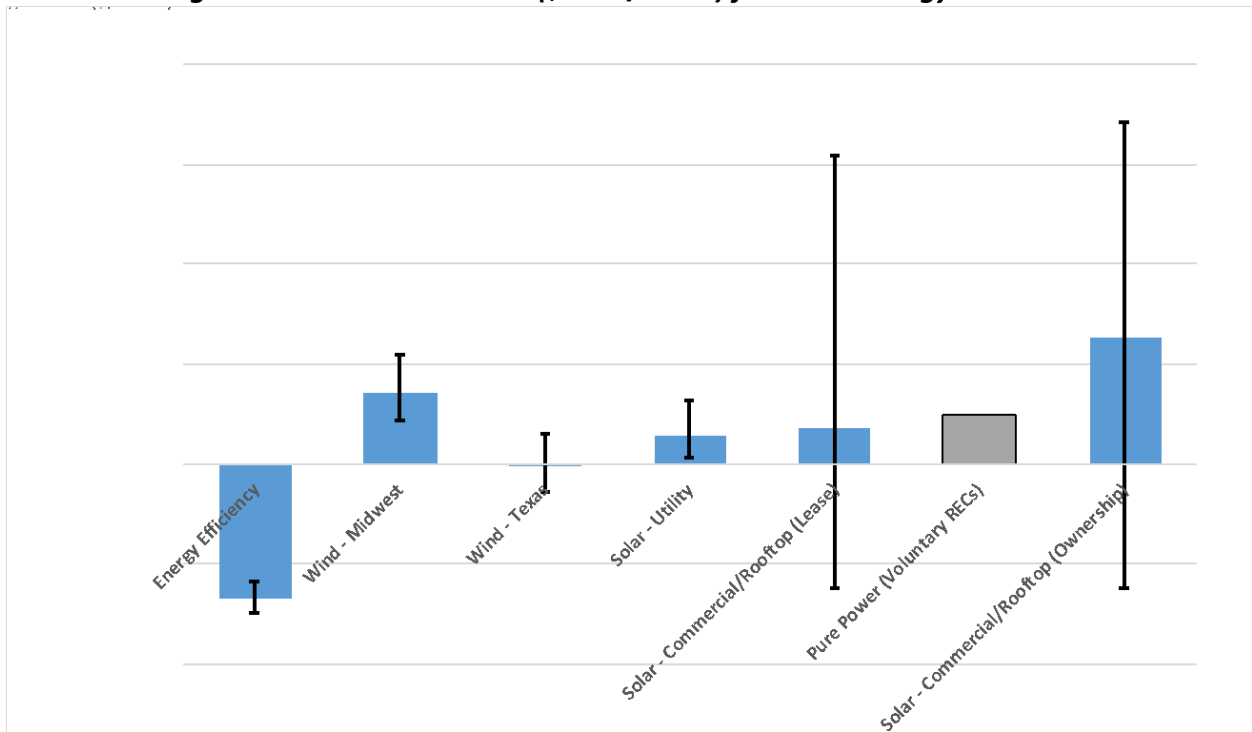
### ***Summary of Net Cost Analysis for City Operations***

As described above, this Report focuses on the net costs for energy efficiency, solar, and wind resources that can be installed in the near-term period from 2020 to 2025. It is beyond the scope of the current Report to estimate net costs for resources that may be installed at a later date, in the period 2025 to 2035. Net costs during that period will depend on the status of Federal, State and utility incentives, the prevailing rate structure and cost of energy, and the total cost of each renewable resource. The near term is expected to provide immediate cost savings, given the status of current incentives. Figure 7 provides a side by side comparison of the net costs for each resource described above. Error bars illustrate the range of potential net costs, based on different ownership models, avoided costs, installed costs, and incentive programs. Here, negative net costs represent cost savings to the City of St. Louis, while positive net costs represent an incremental cost to procure the REC associated with the investment.

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<sup>34</sup> For more information, see: <https://www.ameren.com/missouri/environment/pure-power/how-pure-power-works>

**Figure 7: Levelized Net Cost (\$2020/MWh) for Clean Energy Resources**



Based on this analysis, the Technical Committee offers the following observations:

- **Energy Efficiency** is the only option that is expected to consistently provide cost savings, at a low-, mid- or high- cost estimate. The economic market potential for cost-effective energy efficiency is conservatively estimated to be a cumulative 17,000 MWh, or approximately 5 to 10 percent of the final Resolution 124 goal. City efforts should prioritize energy efficiency before other clean energy options.
- At the lowest cost scenario, **New Solar** resources can offer similar cost savings to energy efficiency programs. However, the net cost of solar will depend significantly on a number of factors – and depending on structure, would represent among the highest cost options to meet the goals of Resolution 124. This range of costs suggests that the City should proceed in a deliberate manner when seeking new solar resources, and coordinate with other regional partners to identify the subset of cost-effective buildings. This effort should come in addition to – and not at the expense of – pursuing more certain and more cost-effective energy efficiency measures. In contrast to City-procured solar energy, new utility-owned solar likely represents a more certain and scalable cost. While new utility-owned solar would represent a net cost to ratepayers, it represents the most cost-effective new generating resource to meet the Resolution 124 goals due to the economies of scale.

- ***New Wind*** resources offer the single largest potential in terms of MWh that can be used to meet the goals of Resolution 124, and new wind purchases will be required. The production tax credit (PTC) is expected to play a major role in the cost-competitiveness of wind resources. The City of St. Louis could procure wind RECs from new resources located out of region at low to no net cost. Indeed, these “virtual” power purchase agreements have become a cornerstone of large corporate renewable procurement programs. However, the added complexity of these programs – combined with the lack of regional benefits – may make this a non-starter for the City of St. Louis. Instead, this Report estimates (based on public costs and power forwards) that new wind procured under utility green tariffs could range from \$8 to \$21/MWh.<sup>35</sup> At the low end, this program offers an opportunity to procure new, additional RECs consistent with the Corporate Renewable Energy Buyers’ Principles that are cheaper than existing RECs. Purchase of Midwest wind would also have a significantly higher impact and contribution towards the City’s broader GHG emission goal. Given the regional benefit in terms of avoided GHG emissions and avoided healthcare costs, the City of St. Louis should strongly consider participation in Ameren’s Renewable Choice green tariff.

## ***Two Pathways to Achieve 100% Clean Energy for City Operations***

Based on the technical analysis presented in Appendix F and the community input received as part of a broader engagement strategy described in Appendix A, Figures 8 and 9 present two different pathways to achieve the goals of Resolution 124. Both pathways assume that the Ameren RES will count towards the City of St. Louis goal. Both include aggressive procurement of all cost-effective energy efficiency within City owned buildings, starting in 2019 and continuing for a five-year period out to 2024.

The Pathways differ primarily in the procurement of RECs associated with new wind and solar resources. In a regional pathway, the City would prioritize the procurement of wind through Ameren’s Renewable Choice (“green tariff”) program, and partner with local solar developers for the development of new solar resources on City-owned property, with a cost-effective lease.

With this regional pathway, net costs to the City (assuming average or mid-point estimates) would be approximately \$2.6 million, with regional avoided health costs of \$7.6 to \$17.3 million. This pathway would maximize GHG reductions, and help the City meet approximately 78 percent of its GHG emission reduction goal (relative to the 2015 baseline). Net costs could be as low as \$1.1 million per year if the City can identify cost effective solar as described above. Notably, at the low end of estimates (assuming avoided retail purchases) EE and solar together could account for cost savings of up to -\$691,000 per year. This energy would account for approximately 10 percent of the Resolution 124 goal. If these costs savings were applied to a

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<sup>35</sup> The cost of Ameren’s Renewable Choice program is not known at the time of this writing.

green tariff subscription (resulting in no new net cost to the City), the City could procure an additional 80,000 MWh or an additional 30 percent of its goal. Said another way – there exists potential for the City to achieve up to 40 percent of its Resolution 124 goal today at no net cost to the City. Equally important: the City of St. Louis spent approximately \$3.6 million on electricity in 2017.<sup>36</sup> These costs savings represent a 20 percent reduction in total utility expenses.

**Figure 8: Net Costs and Benefits, “Regional” Pathway**

	Quantity		Net Cost (\$/MWh)	Total Annual Cost (\$2020)	GHG	Regional Avoided Health Costs	
	(MWh)	Percent			Reductions (Metric Tons)	(\$Annual)	
Ameren Renewable Energy Standard	41,250	15%	\$0.00	\$0		(low)	(high)
New Energy Efficiency	17,361	6%	-\$26.66	-\$462,936	15,127	\$599,613	\$1,356,301
Wind (Utility/Regional)	209,381	76%	\$14.59	\$3,054,526	169,519	\$6,825,333	\$15,439,381
Distributed Solar	7,008	3%	\$7.46	\$52,304	5,617	\$214,032	\$484,601
<b>Total</b>	<b>275,000</b>			<b>\$2,643,894</b>	<b>190,263</b>	<b>\$7,638,977</b>	<b>\$17,280,282</b>

On the other hand, the City could pursue a “least cost” pathway, focused on the procurement of new out of region resources and collaboration with Ameren for new utility-owned solar resources with City ownership of RECs. This pathway would allow the City of St. Louis to meet the goals of Resolution 124 at no new net cost – and could provide annual savings of -\$440,000 per year. These cost savings would come with additional complexity, additional financial risk, and regulatory uncertainty. This pathway would result in fewer avoided GHG emissions (118,000 metric tons, or 53% of 2015 emissions) and fewer avoided healthcare costs (\$0.8 to \$1.8 million).

**Figure 9: Net Costs and Benefits, “Low Cost” Pathway**

	Quantity		Net Cost (\$/MWh)	Total Annual Cost (\$2020)	GHG	Regional Avoided Health Costs	
	(MWh)	Percent			Reductions (Metric Tons)	(\$Annual)	
Ameren Renewable Energy Standard	41,250	15%	\$0.00	\$0		(low)	(high)
New Energy Efficiency	17,361	6%	-\$26.66	-\$462,936	15,127	\$599,613	\$1,356,301
Wind (Out of Region VPPA)	209,381	76%	-\$0.09	-\$19,620	98,113		
Solar (utility)	7,008	3%	\$5.60	\$39,279	5,617	\$214,032	\$484,601
<b>Total</b>	<b>275,000</b>			<b>-\$443,277</b>	<b>118,857</b>	<b>\$813,645</b>	<b>\$1,840,901</b>

### III. COMMUNITY-WIDE ACTIVITIES

This section of the plan recommends strategies the City of St. Louis can take to increase clean energy adoption by City residents and businesses within the City. These recommendations are primarily centered on implementing City policies and influencing state and federal policies that would encourage and increase clean energy adoption in the City. Because Ameren is the only provider of electricity in St. Louis, many of these recommendations seek to influence Ameren to offer additional clean energy programs. Other recommendations involve ways the City can

<sup>36</sup> Based on data provided by City of St. Louis Budget Director Paul Payne; May 2019.

educate residents and building owners, and make investments in energy efficiency and renewable energy easier.

The City of St. Louis, as the leading municipality in the State, carries considerable clout when it comes to influencing energy policy. The City of St. Louis has already influenced clean energy programs offered by Ameren. Ameren cited the adoption of Resolution 124, as well as pledges that several mayors in the region had signed pledges adopting a goal of 100% clean energy in their communities, in its justification for its “Renewable Choice” or green tariff program. Specifically, Ameren said in its testimony on the green tariff:

**Local governments such as municipalities and counties are also increasing their support for renewable energy, including a number of such entities within Ameren Missouri’s service territory. At least seven local municipalities have had their mayor’s sign on to a Sierra Club pledge to support a vision of 100% renewable energy. The City of St. Louis’ Board of Aldermen [sic] recently adopted a resolution that would pledge the City’s commitment to 100% renewable energy by 2035. All of these communities would be able to leverage the Green Tariff as a means of fulfilling their goals.**

And in October 2018, the Missouri Public Service Commission required Ameren to consider clean energy pledges in its long-range planning process (called an “Integrated Resource Plan (IRP):






**Analyze and develop as candidate resource options the satisfaction of municipal and corporate energy goals. The St. Louis Board of Aldermen is formulating a plan to have the City’s electricity sector be met entirely by efficiency and renewable resources by 2035. Once enacted by ordinance such a plan will be a legal mandate subject to the planning requirements of 4 CSR 240-22.060(3)(A). Other cities within Ameren’s service territory have pledged to meet similar goals. Regardless of whether such goals amount to a legal mandate, they present alternatives that need to be modeled.**

Ameren has signaled in other ways that it intends to increase clean energy investments and programs for residents and businesses. In its 2017 IRP, Ameren established a goal to add 700 MW of wind to its generation mix by 2020, and 100 MW of solar by 2027. Its first 1 MW Community Solar Pilot, available to Ameren’s residential and small business customers, was fully subscribed within 55 days of its offering. Ameren is now considering a sizeable expansion of its Community Solar program to allow for more St. Louis residents to go solar. Ameren has also established a goal of reducing its greenhouse gas emissions by 80% by 2050, with interim reduction goals of 35% by 2030 and 50% by 2040 (based on 2005 levels).

While Ameren’s recently adopted clean energy goals are a step in the right direction, the utility’s energy mix will continue to be dominated by coal. The City of St. Louis’ future involvement in shaping local, state and federal policy, as well as educating City residents and businesses about clean energy, will potentially help accelerate Ameren’s investments in clean energy.

Below, this report discusses several strategies for how St. Louis can encourage clean energy adoption in the private sector across the City. In addition to scoring each strategy across the five goals approved by the Advisory Committee, the report notes where strategies overlap with an item from the Climate Action and Adaptation Plan (CAAP).

## Energy Efficiency

Energy Efficiency	Descriptions					
1. Benchmarking Expansion	<i>Expansion and improvement upon benchmarking efforts.</i>	4	2	1	2	2
2. Building Energy Performance Standard	<i>Adopt a Building Energy Performance Standard policy.</i>	3	4	3	2	4
3. Reflective Roofing Requirement	<i>Add reflective or white roofing requirement to commercial building code.</i>	4	3	1	2	2
4. Energy Assessment Requirement for Affordable Multifamily	<i>Require building owners/managers of affordable multifamily buildings to receive an energy assessment for potential energy efficiency measures that could deliver benefits for underserved communities and communities of color.</i>	3	4	4	4	3
5. Require Energy Disclosure at Point of Sale	<i>Adopt a City-wide requirement that all buildings and residences disclose energy usage summary at point of sale.</i>	4	2	2	3	2

### 1. Expand and Improve upon Benchmarking Efforts

The Building Energy Awareness Ordinance, passed in 2017, aims to drive energy efficiency in large commercial buildings starting with benchmarking energy and water use. All buildings that are 50,000 square feet and more must report energy and water use to the City annually through ENERGY STAR Portfolio Manager. Benchmarking is a building operations best practice and St. Louis is among over two dozen cities with a benchmarking policy. Buildings that consistently track and benchmark their energy use see an average energy savings of 2.4% annually, with a total savings of 7% over the course of three years.<sup>37</sup>

<sup>37</sup> [https://www.energystar.gov/sites/default/files/buildings/tools/DataTrends\\_Savings\\_20121002.pdf](https://www.energystar.gov/sites/default/files/buildings/tools/DataTrends_Savings_20121002.pdf)

Benchmarking data can be used by building owners to address opportunities for building performance improvement, leading to less energy used.

On preliminary review of the benchmarking data, there is still room for improvement with the compliance rates, data quality, and building performance.

**Recommendations:**

- Increase compliance rate to 100% by 2020
- Encourage voluntary efficiency improvements with an energy efficiency checklist and energy report card, and promote utility incentives and PACE financing.
- Consider lowering square footage threshold of buildings required to benchmark from 50,000 to 25,000.
- Encourage Preventative or Predictive Maintenance Program for equipment and systems, including operations and maintenance training for facility building manager staff (BOC, GPRO, LEED, etc.). Buildings can save 5 to 20% annually on energy bills by implementing Operations & Maintenance Best Practices ([EPA](#)).

*NOTE: Actions are moving forward as part of the American Cities Climate Challenge.*

Climate Action & Adaptation Plan (CAAP) Connection:

- **Aggressively pursue voluntary and expand mandatory benchmarking** / Mitigation Strategy 1.2 (Build an Energy Efficient City: Retrofit & Renovate Existing Built Environment for Energy Savings)
- **Coordinate with benchmarking program and expand use of Set the PACE St. Louis to finance energy savings projects** / Mitigation Strategy 1.4 (Build an Energy Efficient City: Make Energy Efficiency Measures Affordable)

2. Adopt a Building Energy Performance Standard Policy

As a next step to the Building Energy Awareness Ordinance, the City should consider driving efficiency investments further by requiring a Building Performance Standard. The most obvious, as it is connected to the current reporting mechanism for benchmarking, is ENERGY STAR certification. A policy could first address the largest commercial buildings (100,000 square feet and greater) with a target date to meet the standard by 2023. Commercial and multi-family buildings of 50,000 square feet and greater could follow and meet the standard by 2025. (Note: affordable multifamily buildings with majority low-income tenants should be exempt from such a requirement to prevent short-term rent increases on low-income tenants.) And if buildings cannot reach ENERGY STAR certification or the targeted ENERGY STAR score or targeted Energy Use Intensity, an alternative or more prescriptive compliance path (energy audits, retro-commissioning, lighting upgrades, etc.) can be laid out.

On average, ENERGY STAR commercial office buildings use 35% less energy, generate 35% fewer greenhouse gas emissions and cost \$0.54 less per square foot to operate. (Source: [U.S.](#)

EPA). Additionally, according to the U.S. Department of Energy, every dollar spent on energy efficiency multiples to \$2.23 spent in the local economy.

Building owners can access utility incentives and PACE financing to assist in achieving the desired performance standard or to implement prescriptive actions if they cannot achieve a certification.

*Note: This action is moving forward as part of the Bloomberg American Cities Climate Challenge (ACCC), in which the City is involved.*

CAAP Connection:

- **Achieve retro-commissioning and deep retrofits for commercial & industrial buildings** / Mitigation Strategy 1.2 (Build an Energy Efficient City: Retrofit & Renovate Existing Built Environment for Energy Savings)

### 3. Reflective or White Roofing Requirement

As discussed in the City Operations part of this report, “cool roofs” covered with reflective coatings or membranes are a cost-effective way to reduce building cooling costs and alleviate the heat island effect by reflecting solar radiation back into space. Many cities have passed ordinances amending their building codes to adopt cool roofing for new construction and roof replacements.

We recommend that the City follow these examples by amending its building code to require that flat or low-sloping roofs over a minimum size utilize reflective coatings up to a standard such as ENERGY STAR for new construction or upon replacement.

CAAP Connection:

- **Encourage residential, commercial & industrial cool roof and green roof installations** / Mitigation Strategy 1.2 (Build an Energy Efficient City: Retrofit & Renovate Existing Built Environment for Energy Savings) and Adaptation Strategy 2.2 (Protect Human Health & Society: Create a Healthy & Cool Built Environment).

### 4. Requirement for Owners/Operators of Affordable Housing to Obtain Building Energy Assessment

An essential consideration in implementing Resolution 124 is how the benefits of clean energy can be equitably spread across communities in St. Louis. As the City’s survey results tell us, equity is a central concern among residents, especially for communities of color. We know that low-income residents live in some of the least-efficient housing and have some of the highest “energy burdens” of all utility customers. This means that they spend a higher percentage of their income on electricity bills than the average resident. Energy efficiency can be a long-term solution to high energy burdens in low-income communities, and it can give renters the ability to spend money on other essentials like food, healthcare, and housing costs. Energy efficiency

can reduce the need for bill assistance programs and other social services. But energy efficiency for low-income customers carries special challenges. Low-income residents are more likely to rent their homes, meaning they have little to no ability to invest in energy efficiency or make improvements to the unit. Landlords or owners do not pay the utility bills, and thus do not have an incentive to lower the unit's utility bills through investing in efficiency. This problem is sometimes referred to as the "split incentive." Programs like Ameren Missouri's Multifamily Low-Income (or "Community Savers") program are specifically designed to overcome this problem through higher incentives and a streamlined "one-stop shop" program design making it easy on building owners to participate. Ameren's program also includes a free Building Energy Assessment that will evaluate a building's savings potential and recommend certain efficiency measures that should be taken. More information about a building's energy usage drastically increases the chances that steps will be taken to save energy. The largest challenge for this program is getting building owners/operators to take the first step in contacting the utility and learning about what measures are possible.

The City should consider a policy requiring owners/operators of affordable multifamily buildings to receive a Building Energy Assessment from Ameren Missouri. We do not believe that this requirement will be unduly burdensome, given that Ameren Missouri offers the assessment free of charge. The City may also consider requiring owners/operators to disclose to their tenants information about the building's efficiency relative to the average performance of similar buildings. Such a policy will give tenants and owners/operators the knowledge and the opportunity to save energy and money through participating in the utility's Community Savers program. Most importantly, focusing on energy efficiency in affordable housing will meaningfully serve the goals of Equity, Health, and Cost.

#### 5. *Require Energy Disclosure at Point of Sale for Commercial and Residential Buildings*

Disclosure policies require commercial and/or residential building owners to disclose their buildings' energy consumption to prospective buys, lessees, or lenders. Disclosure laws improve consumers' awareness of the energy use of homes and buildings, which can have a significant impact on its economic value. The building owner must gather energy use data in order to comply with disclosure requirements, a critical step in identifying and prioritizing energy efficiency upgrades.

When leveraged by municipalities, energy disclosure ordinances:

- Help municipalities meet energy reduction targets by motivating building owners, homeowners and potential buyers to invest in energy efficiency measures;
- Help potential building owners and home buyers choose an efficient home, identify possible efficiency improvements that will lower energy cost long-term and accurately estimate the true cost of owning their new building or home;
- Help sellers convey the value of energy efficiency improvements, adding a selling point to their building or home;
- Help real estate agents by giving them insight into a building or home's efficiency features, allowing them to be showcased and properly valued;






- Contribute to workforce development by increasing the demand for home energy audits and home performance upgrades, potentially sparking job creation.

Time of sale energy disclosures create a positive cycle that drives both the commercial and residential real estate market to become more energy efficient.

Climate Action & Adaptation Plan (CAAP) Connection:

- **Adopt a rating and disclosure policy for sale of homes and minimum compliance through the energy code/Mitigation Strategy 1.3**  
(Build an Energy Efficiency City: Make Green Building the Standard Practice)

## Solar

Solar	Descriptions					
6. Solar Requirements for New Construction & Major Renovations	<i>Adopt a requirement that all new construction and major renovations buildings be built ready to support the installation of solar generation.</i>	4	2	1	2	2
7. Streamline Permitting for Renewable Development	<i>Streamline permitting and inspections for renewable development</i>	4	4	3	2	3
8. Solar Bulk Purchasing Program – “Solarize”	<i>Consider coordinating and collaborating with regional commercial institutions as part of a “solarize” campaign to aggregate buyers and achieve lower costs.</i>	4	4	3	2	3

### 6. Solar-Ready Requirements for New Construction & Major Construction

Solar-ready building design is a way to facilitate and optimize the installation of a rooftop solar photovoltaic (PV) system at some point after the building has been constructed. A solar-ready requirement for new construction and major renovations can make future PV system installation more cost-effective by reducing the need for updates in a building, such as the installation of wiring to the roof. According to a [study by the National Renewable Energy Laboratory](#), the cost to make a building solar-ready is 60% less during construction than after construction of the building. Any policy should apply to both residential and commercial buildings.

This should be implemented as an amendment to the ordinances related to building codes, as there is an Appendix to the International Energy Conservation Code for commercial and residential solar-ready requirements.

*Note: This action was included as part of St. Louis' ACCC application.*

CAAP Connection:

- **Develop policy and initiatives to support solar installations** / Mitigation Strategy 2.2 (Accelerate Clean Renewable Energy: Advance Community Scale Renewable Energy Options & Utilization)

#### 7. Streamline Permitting and Inspections for Renewable Development

St. Louis can support renewable energy development (rooftop solar, in particular) by streamlining permitting processes. Permitting can present barriers to installers, residents, and business owners. Unclear permitting applications and extensive permitting reviews increase the so-called “soft costs” of going solar by requiring more time and adding unnecessary overhead expenses. Moreover, the solar industry has substantially matured in recent years, and many companies have become adept at following installation standards so long as there are clear, publicly available guidelines. The City could follow the lead of other cities in adopting and publishing permitting guidelines for established technologies, such as solar PV and solar thermal, as well as for emerging technologies like battery storage.






St. Louis City can also support solar installation by reducing inspection costs. St. Louis City inspectors can sometimes create delays and additional barriers that other jurisdictions do not experience. An opportunity exists to remove process redundancies and reduce waiting times. Inspections can also be better coordinated between building and electrical inspection departments and with Ameren Missouri. The goal should be to limit the judgment calls of individual inspectors and establish clear expectations for solar companies and property owners.

#### 8. Participate in a “Solarize” or Bulk Purchasing Program for Solar Equipment.

St. Louis City should consider hosting or participating in a bulk purchasing program for renewable energy equipment (e.g. solar panels, inverters, conduit, racking, etc.), sometimes referred to as a “Solarize” campaign or program. By aggregating customer demand for rooftop solar, such a program can achieve a reduction in cost for each customer by taking advantage of economies of scale. This strategy can significantly reduce customer acquisition costs, which represent a significant portion of the total cost of installing rooftop solar generation (estimated at 9.2% of the total cost for a residential solar system). Bulk purchasing can help cut these costs while spurring market development and educating communities about renewable energy. “Solarize” campaigns have been the most successful renewable energy bulk purchasing examples, but the model can be applied to a variety of renewable technologies, including solar thermal, heat pumps, and electric vehicles. In the summer of 2019, a new solar bulk purchasing program called “Grow Solar” was formed by the Missouri Botanical Garden, Midwest

Renewable Energy Association, Washington University, Blackrock Consulting and StraightUp Solar. The City should develop ways in which to partner with and promote this new program.

## Education and Training Opportunities

Education/Training Opportunities	Descriptions					
9. Training and Education for City Residents and Building Owners	<i>Conduct trainings and educational activities related to clean energy for City residents and building owners; promote and incentivize participation in Ameren's efficiency and renewable energy programs</i>	4	1	2	3	2
10. Workforce Development for City Residents	<i>Promote and incentivize workforce development around clean energy projects for City residents.</i>	4	4	2	4	2

### 9. Training and Education for City Residents and Building Owners

Although the City of St. Louis' ability to require action by homeowners and businesses is limited, the City can play a significant role in influencing the behavior of its citizens. Through training, education, and promotion, the City can make sure that homeowners, building managers, and businesses have all the information that need to make clean energy investments and enjoy the benefits of existing programs.

#### **Training Opportunities:**

St. Louis could consider its role in providing building operator training, not only for City employees, but also for larger building owners. This may be another opportunity to realize the benefits of St. Louis' successful benchmarking ordinance, now in its third year. Benchmarking and energy efficiency measures informed by benchmarking should be complemented with additional training for building operations staff. According to the Northwest Energy Efficiency Council's evaluations of the Building Operator Certification training, attendees that use energy-efficient procedures and tools learned in the class can save 100,500 kilowatt hours and 1,400 therms annually.<sup>38</sup> City employee and building owner training should include a focus on implementing Operations & Maintenance best practices, which can help save 5–20% on energy bills annually, according to a report by ENERGY STAR.<sup>39</sup>

<sup>38</sup> <https://www.theboc.info/wp-content/uploads/2017/02/BOC-Energy-Savings-FAQ-2.0-web.pdf>

<sup>39</sup> <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/save-energy/comprehensive-approach/operations-and>

***Promoting Existing Ameren Missouri Clean Energy Programs:***

Ameren Missouri now offers a group of energy efficiency and renewable energy programs that provide ways for customers to save money, improve their properties, and reduce their carbon footprint. Many businesses, homeowners, and residents are unaware that these programs exist or lack the knowledge of how to apply for participation. The City of St. Louis can use its web resources, City departments, and other points of contact with City residents to promote participation in these programs. By providing web links, printed materials, and even tutorials on how to apply, St. Louis' businesses and residents can take advantage of these opportunities and help meet the City's Community-Wide goal of 100% clean energy.

Ameren Missouri has a portfolio of energy efficiency programs for both residential customers and commercial/industrial customers. Ameren received approval from the Missouri Public Service Commission for its current portfolio in late 2018.<sup>40</sup> Programs for commercial and industrial customers include both prescriptive incentives (e.g. appliances, motors, insulation, lighting), as well as custom incentives for a whole suite of recommended measures following a building evaluation. The residential programs offer significant rebates for large appliances like air conditioners, water heaters and heat pumps, as well as for products like LED lightbulbs and smart thermostats. In addition, Ameren Missouri has dedicated programs for affordable multifamily buildings and low-income single-family homes, offering increased incentives and co-delivery with Spire Gas to help save on gas bills as well.

Ameren Missouri now offers programs to provide its customers with access to renewable energy. Any residential customer can sign up for Ameren's Community Solar program, which allows customers to purchase up to half of their monthly usage from an Ameren-owned solar system. The current program is a 1 megawatt pilot project located near Lambert Airport. While it currently costs customers slightly more than Ameren's retail rate for electricity, the program allows customers to lock in their solar rate for up to 20 years. Over time, Ameren's retail rate will outpace the solar rate, allowing customers to save over the long run. Ameren has plans to significantly expand its Community Solar program, which should further reduce the program's price. Community solar is a perfect way to provide renewable access for apartment renters or homeowners who don't have the option to install their own solar generation. For larger commercial or industrial customers, Ameren Missouri offers its "Renewable Choice" (or green tariff) program, which has been covered earlier in this Report.

Finally, Ameren has recently announced its Neighborhood Solar program, which will let non-residential customers apply for Ameren-owned solar to be installed in local communities. The goal of the program is to increase awareness of solar, and it includes considerations of workforce development, grid support, electric vehicle charging, and benefits to the community. Advocates will be working with Ameren to ensure that local communities can experience financial and jobs benefits from these projects.

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<sup>40</sup> A complete listing of Ameren Missouri's energy efficiency programs are found at the following web addresses: [www.amerenmissourisavings.com/](http://www.amerenmissourisavings.com/), or at <https://mosaves.com/energy-efficiency-programs-in-missouri/ameren-missouri/>

For all of the above efficiency and renewable programs, Ameren Missouri and the City should investigate ways to work together to push for maximum participation. In particular, these programs offer ways for the City to deliver benefits for low-income residents, people of color, and other marginalized communities.

#### **Facilitate and Publicize Financing Options for Clean Energy:**

The City of St. Louis may consider various financing tools to encourage clean energy investment in the private sector. The City could partner with local, regional, or national financing institutions in order to facilitate the delivery of financial programs and products to local businesses and homeowners. The following are examples of financing programs that have been used to drive clean energy investment:

- *New Market Tax Credits:* Denver has used NMTC allocations to fund rooftop solar on City buildings. This suggests a role for NMTC in financing solar and energy efficiency improvements in low-income neighborhoods.
- *Private financing:* Some cities have started green revolving loan funds based at least in part on private philanthropy, sometimes run by a community foundation such as the Cleveland Foundation. An example of private investment in low-income solar projects is the Connecticut Green Bank's Residential Solar Investment Plan.
- *Energy Improvement Districts:* The Center for Social Inclusion pioneered this concept as a way to channel public and private financing into disadvantaged communities. It requires legislation to establish an Energy Investment Trust and set the criteria for creating Energy Improvement Districts.
- *Business incubators as partners in sustainability training:* This idea is promoted in the Green Cincinnati Plan with an emphasis on outreach to low-income communities to offer training in green business practices. The City could more broadly pursue partnerships with clean energy businesses for job training.

#### **General Public Education Efforts:**

The City has developed helpful educational materials for residents and businesses, such as Climate Action @ Home and Climate Action @ Work. The City should continue to explore ways to widely distribute those materials and develop and distribute additional materials.

CAAP Connection:

- **Aggressively market and expand energy efficiency rebate programs offered by utilities** / Mitigation Strategy 1.4 (Build an Energy Efficient City: Make Energy Efficiency Measures Affordable)






#### **10. Promote/Incentivize Clean Energy Workforce Development for City Residents**

The City should establish ways to promote and incentivize existing and new career training and workforce development programs in the fields of energy efficiency and solar installation. Programs that incentivize training and workforce development for City residents should be

prioritized, including programs targeted at ex-offenders, foster care alumni, and veterans. Illinois is establishing such programs under the Future Energy Jobs Act passed in 2016.<sup>41</sup>

City incentive programs could range from requiring a certain percentage of workers hired by contractors for City-owned projects to have graduated from such programs, to providing tax incentives for contractors or building owners who hire such graduates, to direct partnership with such training programs.

### Other Activities

Other Activities	Descriptions					
11. Link Tax Benefits to Clean Energy Savings	<i>Implement policies that require development projects benefiting from tax abatement or Tax increment Financing (TIF) to meet certain energy standards.</i>	3	3	2	1	3
12. Electric Vehicle-Ready Charging Requirements for New Construction & Major Renovations	<i>Adopt a requirement that all new commercial and residential development be built ready to support EV charging equipment.</i>	4	2	1	1	2
13. Input in State / Federal Policy	<i>Consider opportunities to provide input on clean energy policies at the State level (e.g. MO PSC) and the Federal level (e.g. FERC, EPA).</i>	4	2	2	2	2
14. Form a Sustainability Commission or Advisory Board	<i>Forming a permanent Sustainability Commission or Advisory Board to oversee the implementation of clean energy strategies.</i>	4	0	0	2	0

#### 11. Link Tax Benefits to Investments in Clean Energy, Clean Energy Program Participation.

With such aggressive greenhouse gas and clean energy targets, the City of St. Louis is in a position to influence private development to play a larger role in reaching these goals. If the City is giving up revenue by awarding tax abatement or tax increment financing to development projects, the City could condition these awards on certain building energy standards. The City could choose to adopt the approach that any development projects receiving tax abatements, tax increment financing (TIF), or other tax benefits must demonstrate compliance toward some clean energy standard. Such a standard could include participation in one or more Ameren Missouri energy efficiency or renewable energy program, or achieving a specific ENERGY STAR score.

<sup>41</sup> <https://illinoissolar.org/FEJA-Workforce-Development-Programs>

Other examples of requirements attendant to a receipt of tax benefits could be:

- Achieve a net zero energy certification within two years of being fully occupied;
- Acquire a certain percentage of their energy from renewables;
- Install renewable energy generation on the premises;
- Include a white roof or reflective roof in building plans.

CAAP Connection:

- **Develop a tiered system for energy reduction in new construction linked to public incentive programs; and Create Zero-Net Energy (ZNE) incentive program for residential, commercial & industrial new construction** / Mitigation Strategy 1.3 (Build an Energy Efficient City: Make Green Building the Standard Practice)

See also the case of Denver, CO – new buildings to be net zero by 2035:

<https://www.denvergov.org/content/denvergov/en/environmental-health/environmental-quality/Energize-Denver/net-zero-new-buildings.html>

## 12. Electric Vehicle-Ready Charging Requirements for New Construction & Major Renovations

Although the addition of EVs will increase electricity demand and require more electricity to reach a 100% Clean Energy goal, it is still a necessary strategy for curbing air pollution in the region. As with solar-ready building design, the best way to facilitate the uptake of plug-in electric vehicles is to incorporate electric vehicle supply equipment in new construction and major redevelopment projects in the City. Providing ready access to electric vehicle charging in residential and commercial construction as well as parking structures and parking lots will make a more seamless transition to EVs. This could be implemented as a separate ordinance, zoning requirements, or amendment to building codes.

*Note: This action was included as part of St. Louis' ACCC application.*

CAAP Connection:

- **Develop policy and initiatives to support solar installations** / Mitigation Strategy 2.2 (Accelerate Clean Renewable Energy: Advance Community Scale Renewable Energy Options & Utilization)

## 13. Opportunities for State and Federal Policy Input

### **State Policy:**

The City of St. Louis should consider regular participation at the Missouri Public Service Commission (PSC) in proceedings related to clean energy policy in general and to Ameren specifically. Decisions affecting Ameren's resource mix and customer programs will affect the City of St. Louis' own energy future as well as that of its residents and businesses.

Here are some examples of cases that come before the PSC that can affect St. Louis City:

- *Rulemakings*: The PSC routinely adopts or revises rules that relate to clean energy policy in Missouri, and the City should submit comments to influence those rules in ways that benefit clean energy adoption by both City operations and residents and businesses in the City. These include rules governing utility energy efficiency programs, solar net metering, and compliance with the state Renewable Energy Standard.
- *Integrated Resource Plans (IRPs)*: The PSC requires utilities to produce a new IRP every three years and update that plan in the intervening years. The IRP process allows for stakeholders to weigh in on utilities' long-range (20-year) plans. Similarly, the PSC routinely asks stakeholders to suggest issues (called "special contemporary issues") that Ameren and the other utilities should consider in drafting IRPs (see example above where Ameren will have to consider Resolution 124 in its planning). The City should intervene in Ameren's IRP process and participate as a stakeholder to influence Ameren to continue to invest in clean energy.
- *Rate Cases*: Every few years, Ameren requests a rate increase from the PSC. Rate cases give stakeholders an opportunity to weigh in on how Ameren structures its rates in ways that help or hurt clean energy adoption.
- *Renewable Energy Purchasing Programs*: The City could provide valuable feedback on Ameren-offered programs such as Renewable Choice and Community Solar and input into future similar programs when they are proposed.

The City should establish a budget and process for intervening in PSC proceedings. As an example, the City could amend the ordinance on the duties of the City Counselor to allot a certain percentage of one Assistant Counselor's time for PSC engagement.

The Missouri legislature and state agencies such as the Division of Energy also play a critical role in state energy policy. The City of St. Louis should prioritize involvement in energy policy discussion in these venues. Legislation is necessary for many clean energy policies that affect regulated utilities, such as raising the 100 kW cap for net metering, authorizing community solar and third party options, or changing rate-making practices. The City should allocate a portion of its lobbying resources to these issues in Jefferson City.

#### ***Federal Policy:***

Congress and federal agencies also play an essential role in setting energy policy. The City of St. Louis could prioritize tracking and weighing in on clean energy issues at the Federal level, including Congress, the Department of Energy and the Federal Energy Regulatory Commission.

#### **14. Form a Sustainability Commission or Advisory Board**

Once the 100% Clean Energy Advisory Board completes its assessment, we recommend that the Advisory Board become a more formal, deliberative, and inclusive Sustainability Advisory Board for the City of St. Louis to assist in the implementation of the options and strategies presented

here as well as those in the Climate Action & Adaptation Plan Report and the Sustainability Plan. Requiring that this board's representation includes communities of color would also increase equity in the ways in which the City implements recommendations from this plan and other City plans.

To learn more, visit [www.stlouis-mo.gov/clean-energy](http://www.stlouis-mo.gov/clean-energy)